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AIMCAT 2011

VARC

Innovation [...] may be the most romantic discipline in business. And the eureka moment, that epiphany of total clarity in which a breakthrough invention or discovery occurs, is the most romantic aspect of innovation. In fact, the eureka moment [...] overshadows the historically far more important matter of how an invention reaches the marketplace as a practical innovation. As companies turn their sights anew to top-line growth, it is time to see the eureka moment – indeed the whole gestalt of “breakthrough thinking” – for what it is: largely a myth.

The trouble with the eureka myth is that it causes managers and investors to overestimate the pace of invention and underestimate the fortitude required to move from the early stages of discovery to a marketable product. Thomas Watson, Jr., is one of the few who took – and took sustenance from – a more realistic view. In the 1950s, Watson struggled to move IBM from punched cards to computers... What kept him going through this gruelling process? He thought of the Wright brothers, moving doggedly from one problem to the next, “any one of which could have grounded them for good,” as Watson told it. In the popular imagination, the Wright brothers’ 1903 flight at Kitty Hawk kicked off the age of aviation...[I]t [actually] took four more years of hard, secretive labour before the Wrights were able to demonstrate flight that was sufficiently sustained to convince a sceptical world.

Some seemingly obvious innovations had much longer gestation periods. Malcolm McLean was a 24-year-old truck driver waiting for his cotton bales to be unloaded at a seaport when it occurred to

him how much easier it would be just to drive the truck onto the ship. But it was 20 years before he transmuted the idea into container shipping [...] effectively initiating globalisation.

...The eureka moment is a hugely attractive idea, full of drama. But the act of inventing and improving is a long, hard slog. And the act of capitalising on invention – of managing the transition from a brain wave to the bustle of the marketplace – is the really hard part.

Q1. The author calls the Eureka moment a myth because:

- a) it is more the triumph of emotion and drama than that of intellect.
- b) it is not possible to have total clarity about when a breakthrough invention or discovery occurred.
- c) an attractive idea means nothing without the fortuitous break of practical success.
- d) conceiving an idea is only the beginning of an arduous process that involves developing and selling it.

Number of words and Explanatory notes for RC:

Number of words: 348

The answer can be found out from: '*In fact, the eureka moment [...] overshadows the historically far more important matter of how an invention reaches the marketplace as a practical innovation. As companies turn their sights anew to top-line growth, it is time to see the eureka moment – indeed the whole gestalt of "breakthrough thinking" – for what it is: largely a myth.*' It is a myth because it takes away importance from the more deserving aspect – 'how an invention reaches the marketplace'. It is this How that matters for success and not the Eureka moment.

This is further elaborated in the last para: '*...The eureka moment is a hugely attractive idea, full of drama. But the act of inventing and improving is a long, hard slog. And the act of capitalizing on invention – of managing the transition from a brain wave to the bustle of the marketplace – is the really hard part.*'

Option A: While the Eureka moment is dramatic and romantic, the author doesn't really separate it from the intellect. In fact, even conceiving an idea, for that matter, is an intellectual exercise. So, a distinction between drama and intellect (as related to invention following the idea and taking a product to the marketplace) has not been made. Option A is not the answer.

Option B: The author does divide the phases cleanly into separate parts – the part where the idea has been conceived and the part where the invention is taken to the marketplace. Hence, Option B is not the answer.

Option C: 'Fortuitous break' brings luck into the picture – something the author doesn't pinpoint whilst calling the Eureka moment a myth (Not to be confused with 'fortitude' which is strength/resilience. Hence, Option C is not the answer.

Option D: This explains why the author calls the Eureka moment – the moment when one conceives an idea – a myth. It is just the beginning and there is a much longer journey that takes the idea to the marketplace. Hence, Option D is the answer.

Choice (D)

Q2. The author mentions Thomas Watson, Jr., to drive home the point that

- a) the Wright brothers weren't the only ones who showed mental fortitude to fight a sceptical world.
- b) **it takes indefatigable spirit during the process of innovation to keep moving from solving one problem to the next.** ✓ Your answer is correct

- c) the Wright brothers didn't taste success in 1903 as is popularly imagined.
- d) **the story of IBM and computers is quite similar to that of the Wright brothers and aviation.**

Number of words and Explanatory notes for RC:

Number of words: 348

The author says about Thomas Watson Jr that '*Thomas Watson, Jr., is one of the few who took – and took sustenance from – a more realistic view.*' This realistic view is the opinion that it takes time, and perseverance to achieve something, that success doesn't come overnight.

Option A: The idea was not to take away credit from the Wright Brothers. The idea was to club both the examples to talk about how it takes mental fortitude/perseverance to take an idea to the final stage. Hence, Option A is not the answer.

Option B: This mentions the author's purpose in giving these examples – Wright Brothers, Thomas Watson, etc. The author wanted to show that one needs perseverance (indefatigable spirit) to keep moving further in developing an idea, from solving one problem to another. Hence, Option B is the answer.

Option C: The purpose of the example was not fact-correction. The author wanted to show that Thomas Watson did appreciate the fact that the Wright Brothers toiled much harder behind the scenes to eventually be successful, long after the first breakthrough moment. Hence, Option C is not the answer.

Option D: While this is true, the purpose of the author was to draw parallels in the stories to give us the bigger lesson – that there are problems encountered and it takes time to solve them one by one. Hence, Option D is not the answer. Choice (B)

Q3. Of the following, which study will be of the least help in assessing the arguments made in the passage?

- a) A comparative case study of the top 20 innovations of the decade, to show the time taken between conception of the idea and commercial production.
- b) **An analysis of why several breakthrough ideas are not commercially successful.**
- c) An analysis of the percentage of real-life business ideas that go through long gestation periods.
- d) **A study of the frequently errant estimations of managers and investors about the time taken for the development of an idea into a successful, practical innovation.**

Number of words and Explanatory notes for RC:

Number of words: 348

The author's argument is that we should give less credit to the Eureka moment and instead appreciate the fact that it takes fortitude to go through the phase where an idea is transformed into an invention that eventually reaches the marketplace.

Option A: This data will help us understand the process that goes on between the Eureka moment and the eventual invention/innovation selling point. This data will give us a good picture of how right the author is. Hence, Option A is not the answer.

Option B: This in itself will not help us with the argument as this doesn't talk about how often/why the breakthrough ideas fail midway. The analysis will give us reasons as to why some ideas fail to be commercial. Nevertheless, it won't tell us about the ideas the author highlighted – that success takes time and effort. Whether the idea after fulfilment becomes commercially successful is a different tangent about acceptance of a completed product. This analysis will give us market data but not about what hurdles have been crossed for taking the product to the market. Hence, Option B is the answer.

Option C: The long gestation periods will help assess whether the author was right in pointing out that the Eureka moment is dramatic, but just a myth, and that it takes fortitude to complete the process. Hence, Option C is not the answer.

Option D: Since, the author does blame the managers here - '*The trouble with the eureka myth is that it causes managers and investors to overestimate the pace of invention and underestimate the fortitude required*'- the assessment of their estimations and their accuracies will lend credibility to the author's argument. Hence, Option D is not the answer.

Choice (B)

DIRECTIONS for questions 4 to 9: The passage given below is accompanied by a set of six questions. Choose the best answer to each question.

Recent advances in artificial intelligence have led to the speculation that AI might one day replace human radiologists...[Indeed] deep learning is rapidly advancing, and it's a much better technology than previous approaches to medical image analysis... Radiological practice would certainly benefit from systems that can read and interpret multiple images quickly, because the number of images has increased much faster over the last decade than the number of radiologists. Hundreds of images can be taken for one patient's disease or injury. Imaging and radiology are expensive, and any

solution that could reduce human labour, lower costs, and improve diagnostic accuracy would benefit patients and physicians alike.

What does this mean for radiologists? [The] great majority of radiologists will continue to have jobs in the decades to come — jobs that will be altered and enhanced by AI ... We see several reasons why radiologists won't be disappearing from the labour force...

First, radiologists do more than read and interpret images. Like other AI systems, radiology AI systems perform single tasks (narrow AI). The deep learning models we mentioned are trained for specific image recognition tasks (such as nodule detection on chest CT or haemorrhage on brain MRI). But thousands of such narrow detection tasks are necessary to fully identify all potential findings in medical images, and only a few of these can be done by AI today. Furthermore, the job of image interpretation encompasses only one set of tasks that radiologists perform. They also consult with other physicians on diagnosis and treatment, treat diseases, perform image-guided medical interventions (interventional radiology), define the technical parameters of imaging examinations to be performed (tailored to the patient's condition), relate findings from images to other medical records and test results, discuss procedures and results with patients, and many other activities. Even in the unlikely event that AI took over image reading and interpretation, most radiologists could redirect their focus to these other essential activities.

Second, clinical processes for employing AI-based image work are a long way from being ready for daily use... [Creating] a comprehensive collection of use cases will take many years, further expanding the role for radiologists in the AI world.

Third, deep learning algorithms for image recognition must be trained on "labelled data." In radiology, this means images from patients who have received a definitive diagnosis of cancer, a broken bone, or other pathology ... there is no aggregated repository of radiology images, labelled or otherwise. They are owned by vendors, hospitals and physicians, imaging facilities, and patients...[C]ollecting and labelling them to accumulate a critical mass for AI training will be challenging and time-consuming.

[Finally] ... changes will be required in medical regulation and health insurance for automated image analysis to take off. Who's responsible, for example, if a machine misdiagnoses a cancer case – the

physician, the hospital, the imaging technology vendor, or the data scientist who created the algorithm?

...There are substantial medical and productivity benefits to be gained from integrating AI with radiological practice. The productivity improvements may even mean that radiologists can spend more time doing what many of them find most fulfilling: consulting with other physicians about diagnoses and treatment strategies...

Q4. Radiologists don't have to worry about job security because of all the following reasons EXCEPT:

- a) technological changes related to imaging and radiology are expensive. ✓ Your answer is correct
- b) AI systems do not perform all of the narrow detection tasks required in the field.
- c) radiologists are required for consultations with physicians.
- d) radiologists define technical parameters for imaging examinations.

Number of words and Explanatory notes for RC:

Number of words: 523

Option A: The passage mentions that images and radiology are expensive to show that AI might be used to reduce human labour. So, this option doesn't really talk about job security of radiologists. It mentions the opposite. Hence, Option A is the answer.

Option B: This can be understood from: '*But thousands of such narrow detection tasks are necessary to fully identify all potential findings in medical images, and only a few of these can be done by AI today*'. Radiologists are needed for the job of image interpretation and a lot more. But, even the job of image interpretation is not fully out of their plate. Hence, Option B is not the answer.

Option C: 'They also consult with other physicians on diagnosis and treatment, treat diseases, perform image-guided medical interventions (interventional radiology)'. This can be understood from the underlined portion. Hence, Option C is not the answer.

Option D: This can be understood from '*define the technical parameters of imaging examinations to be performed*'. Radiologists perform several tasks and this is one of them. Hence, Option D is not the answer.

Choice (A)

Q5. Changes in medical regulation are needed to integrate AI into radiological practice because

- a) automated image analysis is not trustworthy.
- b) it needs to be established clearly who is responsible for machine misdiagnosis.
- c) diseases like cancer need data scientists and physicians to work together with the technology vendor.
- d) there are no reliable algorithms for automated image analysis right now.

Number of words and Explanatory notes for RC:

Number of words: 523

Consider the sentences: '*...changes will be required in medical regulation and health insurance for automated image analysis to take off. Who's responsible, for example, if a machine misdiagnoses a cancer case — the physician, the hospital, the imaging technology vendor, or the data scientist who created the algorithm.'*

Option A: The trustworthiness of the image analysis has not been discussed. It is simply a question of who is responsible for the wrong analysis. Hence, Option A is not the answer.

Option B: This is the question the author raises while suggesting that changes will be required in medical regulation. Without regulation, it will be difficult to establish culpability in case of a wrong diagnosis, as there are several parties involved. Hence, Option B is the answer.

Option C: It is not about one disease. Cancer has just been mentioned as an example to raise the question about who is responsible for the wrong diagnosis of a disease. Also, no suggestion has been made about people working together. Hence, Option C is not the answer.

Option D: The author doesn't question the reliability of the algorithms. Algorithms are mentioned only to prove that it is difficult to decide whether the algorithm is responsible, the vendor, the physician or the data scientist. Hence, Option D is not the answer.

Choice (B)

Q6. AI-based image work for clinical processes is still not ready for daily use because

- a) radiologists have been unable to train AI systems.
- b) there aren't enough radiologists in the AI world.
- c) there isn't a comprehensive collection of various scenarios.
- d) AI systems can only perform a narrow range of tasks.

Number of words and Explanatory notes for RC:

Number of words: 523

Option A: The inefficiency or incapability of radiologists hasn't been discussed anywhere in the passage, especially when it came to training AI systems. Hence, Option A is not the answer.

Option B: The passage discusses job security of radiologists. The reverse – paucity of radiologists has been mentioned in that context and not to make a connection with clinical processes. Hence, Option B is not the answer.

Option C: Consider the sentence: '*clinical processes for employing AI-based image work are a long way from being ready for daily use... [Creating] a comprehensive collection of use cases will take many years, further expanding the role for radiologists in the AI world.*' It is clearly mentioned that clinical processes for employing AI-based image work are not ready for daily use and it needs, first of all, a collection that comprehensively covers all the use cases. Hence, Option C is the answer.

Option D: While this has been mentioned elsewhere, it is not the impediment for AI use in clinical processes. It was mentioned to explain about how there are thousands of tasks, of which AI can only perform a few. Hence, Option D is not the answer.

Choice (C)

Q7. Which of the following is the author's central argument in the passage?

- a) AI is taking over from radiologists because of rapid advancement of deep learning.
- b) Radiologists will remain relevant despite advances in AI for radiological practices.
- c) A large amount of data needs to be processed in the world of radiology.

d) Radiologists do not enjoy the work of image interpretation.

Number of words and Explanatory notes for RC:

Number of words: 523

Option A: While rapid advancements in deep learning are happening, the author wouldn't concur to the statement that AI is taking over. In fact, the author goes on to explain why there is a long way to go for AI, whether it is in image interpretation or in clinical processes. Hence, Option A is not the answer.

Option B: The author is trying to explain why radiologists won't lose their jobs to AI systems. The author also mentions that there is a lot more to their work than just image analysis and interpretation. Hence, this option seems to be apt to explain what the author's main message in the passage is. Option B is the answer.

Option C: While it is true that there is a large amount of data that needs to be processed, it is not the author's central concern in the passage for sure. It is one of the points highlighted while explaining why AI is not ready to takeover yet. Hence, Option C is not the answer.

Option D: It has been mentioned that radiologists will find the most fulfilment in consulting with other physicians and in diagnoses. So, the statement that they do not enjoy other work (image interpretation) is factually inaccurate, as it cannot be inferred. Secondly, whether radiologists enjoy the work or not, while being discussed, is not the main idea of the passage. Therefore, Option D can be ruled out. Choice (B)

Q8. It can be most reasonably inferred that labelled data is needed to train deep learning algorithms because

- a) there is no aggregated repository of images.
- b) images from patients receiving definitive diagnosis for their problem could help train AI systems to recognise and interpret images in the future.
- c) there is no exchange of data between vendors, hospitals and physicians.
- d) AI systems can only perform a narrow set of tasks.

Number of words and Explanatory notes for RC:

Number of words: 523

Consider the sentences: ‘*Third, deep learning algorithms for image recognition must be trained on “labelled data.” In radiology, this means images from patients who have received a definitive diagnosis of cancer, a broken bone, or other pathology ... there is no aggregated repository of radiology images, labelled or otherwise. They are owned by vendors, hospitals and physicians, imaging facilities, and patients...[C]ollecting and labelling them to accumulate a critical mass for AI training will be challenging and time-consuming.*’

Option A: There is no repository. But, this leads to difficulty in training AI and deep learning algorithms. This option doesn’t explain why those algorithms need to be trained. So, Option A is not the answer.

Option B: Deep learning algorithms are trained from ‘images from patients who have received a definitive diagnosis of various issues like cancer. So, it can be inferred that image recognition algorithms learn from definitive diagnosis. And adding that to the mention of deep learning for image recognition, it is safe to infer that this training will be used to recognise images in the future and interpret them. In the passage the author does mention that – ‘*the deep learning models we mentioned are trained for specific image recognition tasks (such as nodule detection on chest CT or haemorrhage on brain MRI)*. Hence, Option B is the answer.

Option C: While this is an impediment to the training, it doesn’t explain why the training is needed or how it helps. Option C is not the answer.

Option D: While this has been mentioned elsewhere as a disadvantage of the current AI systems, it doesn’t explain how deep learning models being trained on known diagnosis messages is connected to this. Option D is not the answer. Choice (B)

Q9. All of the following have been mentioned as tasks performed by radiologists EXCEPT:

- a) connecting the analysis of images with existing results and records.
- b) discuss diagnoses and treatment with doctors.
- c) establish examination protocols customised for the patients.
- d) make sure the diagnosis by the machine is accurate.

Number of words and Explanatory notes for RC:

Number of words: 523

Option A: This has been mentioned in the passage: '*They also consult with other physicians on diagnosis and treatment ... relate findings from images to other medical records and test results, discuss procedures and results with patients, and many other activities.*' Hence, Option A is not the answer.

Option B: This can be understood directly from: '*They also consult with other physicians on diagnosis and treatment*'. Hence, Option B is not the answer.

Option C: This can be understood from '*They also ... define the technical parameters of imaging examinations to be performed (tailored to the patient's condition)*'. Hence, Option C is not the answer.

Option D: The author asks for medical regulation to find out who is responsible for the wrong diagnosis. So, it has not been mentioned clearly if radiologists have to check the diagnosis of machines, before passing it on to patients. Option D is the answer.

Choice (D)

DIRECTIONS for questions 10 to 15: The passage given below is accompanied by a set of six questions. Choose the best answer to each question.

The concept of an unconditional basic income is becoming increasingly popular as an alternative to traditional social policy. Instead of providing social benefits in an emergency, during unemployment, or in old age, the government would pay every adult the same lump sum...

Basic income promises each person the freedom to decide if he or she wants to be employed or do nothing at all. It promises politicians the luxury of no longer having to worry about unemployment. And it would give companies an elegant way to justify job cuts [...] as those affected would be financially secure and could look after their children at home or pursue hobbies.

Nevertheless, basic income is a dead end. The most common reason cited for this conclusion is financing: though its costs have not been quantified, it is certain that they would be high. Just how income and wealth should be taxed to pay for it remains an open question. Radically transforming the social system to create a basic income would be the greatest financial gamble in recent history.

But the financial aspect is not even the most important argument against a basic income. Basic income is a seductive poison. It would benefit the margins of society at the expense of the middle class...It most likely would not cost the rich any more than before and would help ease their

conscience. Growing inequality would no longer be a social scandal, since everyone would have an income, albeit close to the poverty line. It is precisely for this reason that there are three main arguments against an unconditional basic income.

First, basic income would further divide society and prevent social mobility. Those who, due to family background, have good prospects for interesting employment and high income would engage in school and study. However, life would become more difficult for young people from working-class and migrant families who are already at a disadvantage in terms of education. The sweet poison of basic income would accompany them at every step of their school life and vocational training. Any resolve to invest in themselves and to improve their lives through work would be put to the test every day, and at [a young] age. And society would be much less concerned about this dilemma than it is today, as everyone would be provided for.

Second, [...] it is impossible to imagine a model that benefits all parts of society equally. Basic income would redistribute resources from those who are employed to those who are not. An unconditional basic income is, in principle, based on a citizen's right to income, but in reality, a basic income scheme is the opposite of social solidarity with the weaker members of society. The middle class, who would finance the basic income but who would not benefit from it materially, are unlikely to find social justice or solidarity in this "unconditional" redistribution. This is one reason why large redistribution programs are unpopular among voters, even among those who are likely to benefit from it.

Third, an unconditional basic income runs counter to the needs of a society with rapidly growing immigration. Migrant workers and other immigrants need more mechanisms to help with social integration, not fewer ... It would be fatal to give people a reason to stop working, to stop improving their qualifications, and to simply stay at home...

Q10. Which of the following weakens one or more of the author's arguments in the passage against basic income?

- a) **People generally find a way to survive with limited resources if that entails less work.**
- b) **People, whose basic needs are taken care of, indulge in hobbies that do not improve their living standards.**

c) People whose needs have been provided for by the government are more likely to vote for the same government again.

d) People who do not have to worry about financial security invest their time in furthering educational qualifications which will enhance their living standard.

Number of words and Explanatory notes for RC:

Number of words: 557

Option A: This strengthens the author's argument. It says people will be happy with a basic income even if it is less and wouldn't look for work or to improve their standards. Hence, Option A is not the answer.

Option B: This strengthens the author's argument. If people do not do anything that improves their living standards once their primary needs are taken care of, it proves the author's point that basic income takes away incentive to work from people. Hence, Option B is not the answer.

Option C: Voters do not appreciate redistribution mechanisms – this has been mentioned in the passage. Even if people do vote for the same government again and that is taken to be their vote in favour of basic income, it doesn't weaken the author's arguments that the long-term effects of basic income are detrimental. Hence, Option C is not the answer.

Option D: The author has established the argument that those who are on basic income do not invest in improving the standards of their life. This option contradicts that presumption and states that basic income allows people to invest in activities that improve their life. Hence, Option D is the answer.

Choice (D)

Q11. Basic income will increase social inequality, according to the author, because

a) it will deprive the less privileged members of society an incentive to enhance the quality of their life.

b) the absence of financing will stop the benefits of basic income from reaching the poor.

c) only those who come from a strong family background can find employment.

d) migrants and working-class people won't be able to afford education anymore.

Number of words and Explanatory notes for RC:

Number of words: 557

Consider the sentences: '*An unconditional basic income is, in principle, based on a citizen's right to income, but in reality, a basic income scheme is the opposite of social solidarity with the weaker members of society.* **The middle class, who would finance the basic income but who would not benefit from it materially**, are unlikely to find social justice or solidarity in this "unconditional" redistribution. **This is one reason why** large redistribution programs are *unpopular among voters, even among those who are likely to benefit from it.*' So, the author clearly mentions two aspects of basic income that show not everyone buys into it. The middle class pays for it but doesn't benefit from it materially. The author equates 'this is one reason why' to 'unconditional redistribution'. Elsewhere, redistribution has been pointed out as '*Basic income would redistribute resources from those who are employed to those who are not.*'

Option A: While the author mentions that voters do not favour redistribution even when it benefits them, it cannot be inferred that they are not aware of the benefits, that they don't favour it because they cannot see that it benefits them. Hence, Option A is not the answer.

Option B: It is not about their opinion on whether people should have an income (leave alone basic income). That itself is a distortion. Also, voters' unhappiness with it has more to do with the 'unconditional redistribution' rather than who should have it and who shouldn't have a basic income. Hence, Option B can be eliminated easily.

Option C: The middle class, who would finance the basic income but who would not benefit from it materially, are unlikely to find social justice or solidarity in this "unconditional" redistribution. The middle-class which finances the basic income is unlikely to find social justice or solidarity in this redistribution. They do not see how it is just/fair. Hence, the scheme is unpopular amongst voters. Option C is the answer.

Option D: Those who finance it (middle-class) do not benefit from it materially. This has clearly been mentioned. Hence, Option D is not the answer. Choice (C)

Q13. The metaphor 'seductive poison' has been used in the passage to show that basic income

- a) is superficially beneficial but is detrimental to society.
 - b) fleeces the working class a lot more than the rich.
 - c) is the greatest financial gamble in recent times.
 - d) redistributes income from the employed middle-class to the unemployed.

Number of words and Explanatory notes for RC:

Number of words: 557

Option A: This is the apt meaning of the metaphor 'seductive poison' – something that is tempting but will harm you. Basic income does give security to people and allow them to pursue their hobbies, but all that is only superficial according to the author. Behind the scenes, it has a negative effect -- it takes away the incentive to work hard and improve the standard of their life. Hence, Option A is the answer.

Option B: Basic income is paid for by both the rich and the middle-class. So, while the middle class feels the pinch a lot more, it is not accurate to say that the basic income fleeces the working class a lot more. More importantly, that doesn't really explain what seductive poison is, because the meaning of seductive poison needs to have a positive intonation to it as well, something that seduces should be attractive on the surface with negative in the core. Hence, Option B is not the answer.

Option C: While the author does call universal basic income the greatest financial gamble in recent times, that has no bearing on calling it seductive poison. Seductive poison, the term, is related to the adverse consequences on society, and on people who lose incentive to work. Hence, Option C is not the answer.

Option D: While this statement is true, it doesn't talk about what is seductive about it – and secondly, the author uses the term to describe the potential damage done by basic income. What is mentioned here in this choice is not the potential damage but what actually happens (or rather what the author thinks and takes for granted). So, it cannot really be said that the term seductive poison refers to the redistribution (as unfair as it may seem). It is more the consequence of the redistribution.

Choice (A)

Q14. Basic income will make job cuts a more agreeable act for employers because

- a) it will not lead to social scandals.
- b) it will prevent the unemployed from falling below the poverty line.
- c) job cuts will be easier to defend when those who have lost their jobs still have a way of getting by.
- d) when everyone is provided for, there aren't any ethical dilemmas for employers when it comes to job cuts.

Number of words and Explanatory notes for RC:

Number of words: 557

Consider the sentences: '*And it would give companies an elegant way to justify job cuts [...] as those affected would be financially secure and could look after their children at home or pursue hobbies.*'

Option A: The author didn't connect social scandals and employers who justify job cuts. These are two entirely different threads of thought. The social scandal referred to in the passage is the 'outrage' that people generally show for increasing inequality. However, whether there is the same outrage over job cuts – we cannot infer. Hence, Option A is not the answer.

Option B: Whether those who have lost their jobs will fall below the poverty line or not cannot be inferred as, once again, these are two disconnected issues. Hence, Option B is not the answer.

Option C: This is apt as it explains what employers gain from basic income – the justification that they aren't making families insecure, because the employees who have lost their job still have a safety net. Hence, Option C is the answer.

Option D: This option assumes that employers have **an ethical dilemma** when it wants to go for job cuts. It may not be the case. Basic income gives an elegant way to employers to justify job cuts, sure. But, in the absence of it, whether they will have an ethical dilemma or not, we cannot be sure. Hence, Option D is not the answer.

Choice (C)

Q15. The financial aspect is not the most important argument against basic income because

- a) it is not clear how income and wealth should be taxed to pay for the basic income.
- b) the costs of financing unconditional basic income have not been quantified.
- c) the consequences of such a radical change to the social system are hard to estimate.
- d) the systemic effect of basic income on society is far more deleterious than the financial challenges of implementing it.

Number of words and Explanatory notes for RC:

Number of words: 557

While financing is part of the argument against basic income, the author believes there are other bigger arguments. This can be understood from: 'But the financial aspect is not even the most important argument against a basic income. Basic income is a seductive poison. It would benefit the margins of society at the expense of the middle class...It most likely would not cost the rich any more than before and would help ease their conscience. Growing inequality would no longer be a social scandal, since everyone would have an income, albeit close to the poverty line. It is precisely for this reason that there are three main arguments against an unconditional basic income.'

Option A: This is one of the reasons why financing is an issue – because it is unclear how the taxing should happen. So, taxing comes under the umbrella of financing, which the author says is not the most important argument. This option explains why financing is an issue and not 'why financing is not the biggest issue' whose answer should be 'something bigger'. Option A is not the answer.

Option B: Even this option talks about why financing is an issue rather than explaining what bigger issue there is than financing or what bigger argument there is against basic income than financing. Hence, Option B is not the answer.

Option C: This too is an explanation of why financing is one of the worries when effecting basic income. It doesn't explain why financing is not a big enough problem to be called the most important argument against basic income. Hence, Option C is not the answer.

Option D: This is the only option that goes out of financing and discusses the broader idea. This option explains that the systemic consequences of basic income are a bigger problem than the financial challenges associated with it. That is why financing, according to the author, is not the biggest issue. Option D is the answer.

Choice (D)

DIRECTIONS for questions 16 to 18: The passage given below is accompanied by a set of three questions. Choose the best answer to each question.

Victory in Japan's upper house elections gives Prime Minister Shinzo Abe the political clout to do many things. The first should be to extricate Japan from the foolish trade war he's launched against neighbouring South Korea. Abe's government started the confrontation earlier this month when it restricted exports to South Korea of three materials critical to the manufacture of semiconductors and smartphone displays, thereby threatening to disrupt tightly linked supply chains and drive up the price of everything from memory chips to iPhones.

Japanese officials claimed the measure was intended to prevent high-tech exports from being illegally transferred to North Korea. But the move was clearly a retaliation for recent South Korean

court decisions awarding damages to laborers forced to work for Japanese companies during the colonial period.

... Japan contends that the 1965 treaty re-establishing diplomatic relations between the two countries, under which it gave Seoul \$500 million in aid and low-interest loans, settled all compensation claims "completely and finally." South Korea, meanwhile, has rejected Abe's call for third-party arbitration, proposing instead that they form a joint fund to pay the court awards.

The U.S., which has traditionally smoothed over tensions between its two allies, has been slow to intervene. If nothing changes, the conflict will likely widen: Japan may [soon] remove South Korea from a "white list" of countries exempt from most restrictions on so-called dual-use exports. That would be vastly more disruptive than the current curbs and could shrink investment and employment in South Korea...

Abe, for his part, is abusing trade measures to resolve a political dispute. [But] the damage could go well beyond Abe's reputation. Japanese suppliers will lose market share – and their reputation for reliability – if some of their biggest customers are forced to look elsewhere. South Korea will no doubt seek to retaliate if Japan proceeds with its "white list" threat; boycotts of Japanese goods are already spreading...

There's an obvious compromise: Japan should lift the new export controls and resist adding more, while South Korea should agree to arbitration... Having started this fight [...] Abe should make the first move. And, the U.S. should ensure the South Korean president swiftly reciprocates...

Q16. Which of the following is a repercussion that Japan is likely to face for the trade war it has launched against South Korea?

- a) **Japanese suppliers of semiconductors will lose their reputation for reliability.**
- b) **There'll be increased boycotts of Japanese goods in South Korea.**
- c) **Japan stands to lose its reputation for not honouring court decisions.**
- d) **Japan will no longer play a critical part in the manufacturing of semiconductors.**

Number of words and Explanatory notes for RC:

Number of words: 359

Option A: It has not been mentioned that the semiconductors are manufactured/supplied by Japan. '*Abe's government started the confrontation earlier this month when it restricted exports to South Korea of three materials critical to the manufacture of semiconductors and smartphone displays ...'* – From this, it can be understood that probably it is South Korea which manufactures semiconductors and not Japan. Also '*Japanese suppliers will lose market share — and their reputation for reliability*' this doesn't indicate what the suppliers are supplying. Hence, Option A is not the answer.

Option B: One thing we know for sure will happen is that Japanese goods will be boycotted in South Korea. This can be understood from: '*South Korea will no doubt seek to retaliate if Japan proceeds with its "white list" threat; boycotts of Japanese goods are already spreading...*' Hence, Option B is the answer.

Option C: The reputation that is at stake is of the Japanese suppliers. No connection has been made between Japan's reputation and respecting the court decision. Hence, Option C is not the answer.

Option D: This is an extreme extrapolation of the arguments. While Japan's reputation will be dented and it will affect the supply chains, whether or not Japan will play a critical part in manufacture of semiconductors is open to conjecture. Hence, Option D is not the answer.

Choice (B)

Q17. The author is least likely to agree with which of the following statements?

- a) Trade shouldn't be affected because of political disputes.
- b) Third-party arbitration can help in settling conflicts between these two countries.
- c) Japan's claim of having settled compensation claims 'completely and finally' is unfounded.
- d) The reputation of Japanese suppliers could be tarnished by Shinzo Abe's trade war.

Number of words and Explanatory notes for RC:

Number of words: 359

Option A: The author asserts that '*Abe, for his part, is abusing trade measures to resolve a political dispute.*' The word **abuse** clearly indicates that the author isn't a big fan of using trade measures to solve political problems. The author right through the passage is exhorting that there should be a resolution, showing that trade being affected is not a good sign. So, the author will agree with this choice.

Option B: The author ends the passage with '*And, the U.S. should ensure the South Korean president swiftly reciprocates...*' clearly indicating that a third party (the US in this case) could help resolve the conflict. The author also mentions this: '*The U.S., which has traditionally smoothed over tensions between its two allies, has been slow to intervene.*' Hence, we can say the author will agree with this statement. Option B is not the answer.

Option C: The author didn't take sides anywhere in the passage. The author doesn't really comment on whether Japan has settled the compensation claims or not. The author's tone right through the passage is neutral on the court decision. Hence, the author will not agree with a statement that places the blame squarely on Japan by suggesting that Japan's claim is '**unfounded**'. Hence, Option C is the answer.

Option D: From '*Japanese suppliers will lose market share — and their reputation for reliability — if some of their biggest customers are forced to look elsewhere,*' it can be understood that the author does believe that the reputation of Japanese suppliers will be tarnished because of the trade war. Hence, Option D is not the answer.

Choice (C)

Q18. The author's central argument in the passage is that

- a) the Japanese Prime Minister is risking his credibility to punish South Korea.
- b) trade shouldn't be used to settle personal scores.
- c) South Korea should concede to Japan's argument of having already settled the compensation claims.
- d) Japan and South Korea must settle their differences without escalating the situation.

Number of words and Explanatory notes for RC:

Number of words: 359

Option A: While the author suggests that Shinzo Abe should use his clout to end the trade war, the author doesn't suggest that the Japanese PM is risking his credibility (it is the credibility of the Japanese suppliers which is at risk). Risking one's credibility to means to put it on stake – that if something goes wrong, the credibility is gone. Hence, Option A is not the answer.

Option B: While the author does mention that trade measures are not a way to resolve 'political conflicts', it is too far fetched to use the term 'personal scores' – since there are no personal issues between Shinzo Abe, and South Korea's preside. Hence, Option B is not the answer.

Option C: The author doesn't take sides anywhere in the passage as far as the actual conflict is concerned. The author is only concerned about trade getting affected. So, whether South Korea should concede ground to Japan or not is definitely not the central argument or even a tangential argument in the passage. Option C is not the answer.

Option D: This is the central argument of the passage as can be understood from the last para, where the author only talks about conflict resolution. The author suggests Japan take some steps, and also recommends that South Korea let US play the role of a third-party arbiter. Furthermore, in the first para, the author says: 'The first should be to extricate Japan from the foolish trade war he's launched against neighbouring South Korea'. Hence, Option D is the answer.

Choice (D)

DIRECTIONS for questions 19 to 24: The passage given below is accompanied by a set of six questions. Choose the best answer to each question.

The pattern of human life is profoundly influenced by the rotation of the Earth and the resulting day-night cycle. This circadian rhythm influences our biochemical and physiological states as well as our psychological and social behaviour.

Our relationship with the day-night cycle can vary widely. Some people – night owls – prefer to get up and stay up late. Others – larks – are morning people who are most active early in the day. Others do not fit either "chronotype."

Clearly, a person's chronotype will have a huge impact on the people they interact with – it's hard to interact with somebody who is asleep when you are awake. So, it's easy to imagine that night owls are more likely to interact with each other than with larks and vice versa ...

... Talayeh Aledavood at Aalto University in Finland and a few pals...have studied the social network and sleeping patterns of over 1,000 individuals for a period of a year. And their work produces some counterintuitive findings. Their method is straightforward. The team gave 1,000 volunteer students smartphones equipped with an app that measures the phone's activity...and the number of people it calls or texts. That gives the researchers the raw data to study each person's pattern of daily behaviour. "We use time-stamped data on 'screen-on' events from the smartphone data-collection apps to assign a behavioural chronotype to each participant," say Aledavood and co.

The team then categorised people as "larks" if they had more activity...between 5 a.m. and 7 a.m. They defined "owls" as people who had more-than-expected activity between midnight and 2 a.m. The team categorized the rest – more than half of all the participants – as intermediates. Next, the team built a social network showing the links between all the participants. Each individual is a node in this network and is linked to another if they have communicated with each other via a phone call or text.

Finally, the team analyzed the social networks associated with owls and larks to see how they differ. In particular, they looked at how popular each node is, how likely a member of a group is to connect to others of the same group, whether they play central roles in the network, and so on. The results make for interesting reading. "Evening-active owls have larger personal networks than morning-active larks, albeit with less frequent contacts to each network member," say Aledavood and co. They also say owls are more central in the network.

The way members of these groups connect to others like them – their homophily – is the most unexpected finding. Aledavood and co say that owls connect to other owls more often than pure chance would suggest. So, they are strongly homophilic. But larks show no such tendency. "Surprisingly, this homophily is not visible in the case of larks," says the team, clearly puzzled by this finding.

One potential explanation is that social gatherings tend to take place later in the day. So, people who stay up late are more likely to take part and to organize them. "It is perhaps not surprising that there is a bias in favour of the evening-active chronotype," say Aledavood and co. The researchers also suggest that larks spend more of their time alone and interact with fewer people because social events are much rarer in the early mornings.

Q19. Owls display homophily more than larks do probably because:

- a) of pure chance.
- b) more social gatherings taking place in the evenings than in the mornings. ✓ Your answer is correct
- c) people who stay up late miss out on social networking opportunities.
- d) larks prefer solitude to social gatherings.

Number of words and Explanatory notes for RC:

Number of words: 550

Option A: The experiments clearly suggest that it is not just a coincidence and that, there is a pattern to the way larks and owls socialise. Also the author says that it is more than pure chance. Hence, Option A is not the answer.

Option B: Consider the sentence: '*One potential explanation is that social gatherings tend to take place later in the day. So, people who stay up late are more likely to take part and to organise them.*' This suggests the reason why owls display more homophily. Also consider: '*Aledavood and co say that owls connect to other owls more often than pure chance would suggest. So, they are strongly homophilic.*' So, the author connects homophily and the timings of social gatherings. So, Option B could be the potential explanation. Option B is the answer.

Option C: The passage seems to suggest that people who stay up late are the ones who socialise more because of social gatherings predominantly taking place in the latter part of the day. So, the information here is inaccurate. Option C is easy to eliminate.

Option D: The author doesn't mention larks' need for solitude. Instead it is mentioned that: '*The researchers also suggest that larks spend more of their time alone and interact with fewer people because social events are much rarer in the early mornings.*' Hence, Option D is not the answer.

Choice (B)

Q20. Larks and owls can be distinguished based on the understanding that:

- a) the former finish their work between 5 a.m. and 7 a.m., whereas the latter complete their work after midnight.
- b) the former indulge in more activity than the latter in the second half of the day.

- c) the former have more-than-expected activity early in the morning, whereas the latter have more-than-expected activity late in the night.
- d) the former maintain better interpersonal relationships than the former.

Number of words and Explanatory notes for RC:

Number of words: 550

The differences can be understood here: 'Some people – night owls – prefer to get up and stay up late. Others – larks – are morning people who are most active early in the day'.

And here: 'The team then categorised people as "larks" if they had more activity...between 5 a.m. and 7 a.m. They defined "owls" as people who had more-than-expected activity between midnight and 2 a.m.' Also consider: '...owls connect to other owls more often than pure chance would suggest. So, they are strongly homophilic. But larks show no such tendency'.

Option A: When the larks or night-owls 'finish' their work has not been discussed in the passage. It is more to do with the timing during which more-than-expected activity was registered. Hence, Option A is easy to eliminate.

Option B: The author doesn't draw a distinction between first and second halves of the day. The author only mentions that 'social gatherings tend to take place later in the day'. Also, larks register more activity early in the morning (5am – 7am) than night-owls. Hence, Option B is not the answer.

Option C: This has been clearly mentioned by the author (as underlined above). Larks register more activity in the morning, while owls register more activity between late in the night. Hence, Option C is the answer.

Option D: Such a statement cannot be made because larks do not socialise as much as owls. The author makes a statement on the greater homophily of owls compared to larks because of the timing of the social gatherings, although homophily cannot be exactly extrapolated to use 'interpersonal relationships'. Hence, Option D is not the answer.
Choice (C)

Q21. Which of the following, if true, most weakens the conclusion that larks spend more of their time alone than owls do?

- a) Larks use smartphones only for work early in the morning.
- b) Night-owls prefer to focus on their work in the solitude of midnight.

- c) Larks meet others in person rather than socialise through phone calls and texting.
- d) Jogging and laughter clubs that meet daily in the early morning are as crowded as social gatherings are in the evening.

Number of words and Explanatory notes for RC:

Number of words: 550

The conclusion can be understood here: '*The researchers also suggest that larks spend more of their time alone and interact with fewer people because social events are much rarer in the early mornings.*' The reason given here is that social events are much rarer in the early mornings.

Option A: If this were true, it will strengthen the conclusion that larks do not socialise much. That is because even when their smartphone is registering activity, it is not socialising. The activity is work-related. Hence, Option A is not the answer.

Option B: Night-owls register more activity between midnight and 2am and this has been related to the preponderance to social gatherings which usually take place later in the day. Their work and preferences for solitude have not been mentioned in the passage. Hence, Option B is not the answer.

Option C: If this is the case, then this activity cannot be registered on the phone. It will contradict the finding that larks prefer to stay alone, when all they are doing is not using a phone for socialising. However, the timing of social gatherings is still a problem (take place later in the day). This option doesn't tell us how often larks meet friends/acquaintances. Hence, Option C is close but not the answer.

Option D: This option contradicts the assumptions of the study, that social gatherings take place predominantly in the evening. Here, we can see that the numbers are the same, morning or evening, and also that the frequency of the social gatherings in the mornings is daily as well. This weakens the conclusion that larks prefer staying alone. Hence, Option D is the answer.

Choice (D)

Q22. Which of the following studies will most help in assessing the arguments of the researchers?

- a) A study of the percentage of people whose smartphone activity is a good indicator of their sleep cycle.
- b) A study of the average number of people present in social gatherings during the day and in the night.

- c) A study comparing how deeply night owls and larks sleep.
- d) A study of how our social behaviour is affected by the number of hours we sleep.

Number of words and Explanatory notes for RC:

Number of words: 550

Option A: The major assumption of the research group is that smartphone activity is a good indicator of sleep cycle – that if unusual activity is detected on smartphones, say in the morning, then these are morning people or larks. However, it is possible that a majority of the people waking up in the morning may stay completely away from the smartphones. Hence, this study will help check how accurate the assumption of the research group is. Option A is the answer.

Option B: The argument is based on the understanding that there are fewer social gatherings in the morning than in the night. A study of the average number of people would still not give relevant information to judge such an argument. This is because the average could be quite high for a social gathering in the morning without affecting the main argument of the passage, in a scenario where far fewer gatherings take place in the morning. Hence, Option B is not the answer.

Option C: The consistency of sleep will not affect the research group arguments since it is not part of the discussion. The passage doesn't distinguish between different types of sleep – and the related effects of light or deep sleep. Hence, Option C is not the answer.

Option D: The number of hours someone sleeps is not a part of this discussion or research. Hence, this option will not help much in assessing the arguments.

Choice (A)

Q23. The author suggests that the social circle people maintain is affected by their chronotype because

- a) one can only interact with those who have a similar sleep cycle.
- b) night owls and larks have entirely different tastes and preferences.
- c) the sleep cycle determines the work cycle of a person.
- d) the personalities of people with different sleep cycles varies completely.

Number of words and Explanatory notes for RC:

Number of words: 550

Consider the sentences: '*Clearly, a person's chronotype will have a huge impact on the people they interact with – it's hard to interact with somebody who is asleep when you are awake.* So, it's easy to imagine that night owls are more likely to interact with each other than with larks and vice versa ...'

Option A: This option agrees with the author's line of reasoning. Who is awake when you are awake, determines the people you interact with. So, the chronotype determines one's social circle. Hence, Option A is the answer.

Option B: The tastes and preferences of individuals have neither been connected to the sleep cycle nor touched upon vividly in this passage. Hence, Option B is not the answer.

Option C: A connection has not been made between sleep and work cycles. It has been discussed that owls are more likely to socialise later in the night but whether they work late in the night or not has not been discussed. Hence, Option C is not the answer.

Option D: A comparison between personalities and sleep cycles has not been done in the passage. It was entirely about sleep cycle and the possibility of socialising based on the timings of social gatherings. Hence, Option D is not the answer.

Choice (A)

Q24. Which of the following hypothesis was invalidated by the unexpected finding (mentioned in the penultimate para of the passage) that puzzled the researchers?

- a) Night owls are more outgoing than larks. **X Your answer is incorrect**
- b) Larks are more outgoing than night owls.
- c) Night owls socialise with larks as much as they socialise with other night owls.
- d) Larks socialise with other larks more than they socialise with night owls.

Number of words and Explanatory notes for RC:

Number of words: 550

Consider the sentences: 'Talayeh Aledavood at Aalto University in Finland and a few pals...have studied the social network and sleeping patterns of over 1,000 individuals for a period of a year. And their work produces some counterintuitive findings.'

Also, 'The way members of these groups connect to others like them—their homophily – is the most unexpected finding. Aledavood and co say that owls connect to other owls more often than pure chance would suggest. So, they are strongly homophilic. But larks show no such tendency. "Surprisingly, this homophily is not visible in the case of larks." says the team, clearly puzzled by this finding.'

Option A: The author didn't set out to prove that one type of people are more outgoing than the others. The argument was simply that we tend to socialize more with those whose sleep cycles match with ours. Also, it is hard to define a loose term like 'outgoing'. Hence, Option A is not the answer.

Option B: Once, again, as in the previous option, such a hypothesis has not been discussed anywhere in the passage. Hence, Option B is not the answer.

Option C: The author clearly states early in the passage that night owls can socialize with night owls more than they do with larks and vice-versa because the sleep cycles coincide. So, this option does weaken that hypothesis. However, this option is not a finding of the researchers' study. They found that night owls are more homophilic – they socialize more with other night owls. Hence, Option C is not the answer.

Option D: This is the hypothesis that was countered by the researchers' unexpected findings. Larks don't show the homophilic tendencies shown by the night owls according to the findings of the researchers. In other words, the research doesn't show that larks socialize more with other larks just as night owls socialize more with other night owls. Hence, the findings surprised the researchers. Option D is the answer.

Choice (D)

Q25. DIRECTIONS for question 25: The following question has a set of four sequentially ordered statements. Classify the statements into Facts, Inferences and Judgements based on the following criteria:

- Facts, which deal with pieces of information that one has seen, heard or read; which are known matters of direct observation or existing reality; which are open to discovery or verification (The answer option represents such a statement with an 'F')

- Inferences, which are logical conclusions or deductions drawn about the unknown, on the basis of the known i.e. based on the knowledge of facts (The answer option represents such a statement with an 'I')

- Judgments, which are opinions, or recommendations or estimates or anticipations of common sense or intention that imply approval or disapproval of persons, objects, situations and occurrences in the past, the present or the future The answer option represents such a statement with a 'J')

Select the answer option that best describes the set of statements.

- i. When you come into contact with the competition establishment in the rich world – regulators, academics, lawyers – the cruellest comparison is certainly with financial watchdogs before the 2008-09 crash.
- ii. They are the proud custodians of an internally logical set of rules, developed over years, that do not seem to be producing good results and cannot easily be communicated to anyone outside the priesthood.
- iii. Most competition authorities are unwilling to be held accountable for the level of competition in the economy; indeed they go further and insist that it is impossible to measure.
- iv. Given the profound consequences of a rise in corporate power, that is an unsustainable position and will have to change.

a) **JIJF**

b) **FJIJ**

c) **JJJJ**

d) **IJJJ**

Statement (i) is a judgment. There is an estimate or anticipation of something in the first part – When you come into contact with the competition establishment.... There is a comparative opinion presented in the second part – the cruellest comparison is with financial watchdogs – J. Note the use of the adjective 'cruellest' and the adverb 'certainly' in this sentence, which make it opinionated. So, J.

Statement (ii), again, is a judgment. 'proud custodians of an internally logical set of rules' is a subjective opinion. Also "do not seem to be producing" cannot be verified. "**do not seem** to be producing **good results**" and "**cannot easily** be communicated" are subjective in tone – J.

Statement (iii) is also a judgment. '**Most** competition authorities are unwilling to be held accountable' is subjective and cannot be verified or is not derived from any knowledge of facts. 'they go further and insist that it is impossible to measure' is again a subjective opinion. So, it qualifies as a judgment – J.

Statement (iv) also offers subjective opinion in "profound consequences", "unsustainable position". It also provides a recommendation:will have to change – J.

The correct answer is JJJJ.

Choice (C)

Q26. DIRECTIONS for question 26: 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. Some take it for spineless laxity in the face of what ought to be fought or forbidden, while others see it as a demeaning fraud that spares prohibition but withholds approval.
2. Tolerance is a strange but indispensable civic virtue.
3. The tolerant themselves are not immune to its tricks and subtleties: it takes little for them to shout intolerantly at each other about how far toleration should go.
4. It requires people to accept and live calmly with individuals and practices of which they disapprove.

Sentence 1: Sentence 1 cannot start the paragraph. It has some clues 'some', 'others' and 'it' which indicate that some other sentence has to precede this sentence.

Sentence 2: Sentence 2 sounds introductory in tone. It can serve as the topic sentence of the para.

Sentence 3: Sentence 3 has the emphatic pronoun 'themselves' referring to the 'tolerant'. It tells us that the tolerant also behave in an intolerant manner.

Sentence 4: Sentence 4 has the pronoun "it". This sentence needs a precedent.

So sentence 2 is a general sentence that can begin the paragraph. Sentence 2 is followed by sentence 4. "strange but indispensable" in sentence 2 is explained by "people **should accept and live** calmly with individuals and practices of which they **disapprove**" in sentence 4.

Sentence 4 is followed by sentence 1. "People" in sentence 4 is followed by "some" and "others" in sentence 1. "it" in sentence 1 refers to "tolerance". So, the requirement of tolerance is mentioned in sentence 4. And the reaction or negative attitude of people towards tolerance is given in sentence 1.

'The negative attitude shown by people towards tolerance' in sentence 1 is continued by the 'reaction of the tolerant people towards tolerance' in sentence 3. "not immune to its tricks and subtleties" and "shout intolerantly at each other about how far toleration should go" in sentence 3 run parallel to "spineless laxity" and "demeaning fraud" in sentence 1. So, sentence 3 follows sentence 1. Hence 2413. Ans: (2413)

Q27. DIRECTIONS for question 27: The following question has a paragraph from which the last sentence has been deleted. From the given options, choose the one that completes the paragraph in the most appropriate way.

Does not the artistic principle in philosophical thought deserve the attention of, and do credit to, the thinking mind, and vice versa? In a certain generalised sense, the true philosopher is like the poet. He, too, must possess the aesthetic gift of free associative thinking in integral images. And in general, one cannot achieve true perfection of creative thought in any field without developing the ability to perceive reality from the aesthetic standpoint. _____

- a) No scientifically, let alone artistically, thinking person can remain deaf to the wise voice of true philosophy, or can fail to study it as a vitally necessary sphere of culture, as the source of world-view and method.
- b) Naturally, philosophy is distinguished from the other sciences by its being related far more closely to the aesthetic principle, to art. ✗ Your answer is incorrect
- c) Without this precious intellectual prism, everything that goes beyond the empirical description of facts and beyond formulae and graphs may look dim and indistinct.

d) And this is a reflection of the contingencies of our theoretical capacities, rather than an indication of objective intransigence.

Option A: Option A sounds like the introduction sentence of another paragraph, preferably earlier in the thought flow of the text. This is because it brings in the idea of 'artistically thinking person' without really connecting with 'the aesthetic standpoint' mentioned in the penultimate sentence of the paragraph. It also unnecessarily brings in the idea of culture that runs tangent to the discussion in the paragraph. Option A is not the answer.

Option B: Option B brings in a new point of view: how philosophy is differentiated from the other sciences through their relation to the common hook "aesthetic principle". This view can be mentioned in another paragraph and this sentence can function as one of the earlier sentences in that para. This option cannot conclude this para as it is out of scope and does not link with the penultimate sentence. Option B is not the answer.

Option C: Option C functions as the apt sentence to complete the paragraph. The para talks about the importance of 'artistic principle in philosophical thought', 'aesthetic gift of free associative thinking' and 'the ability to perceive reality from the aesthetic standpoint'. So "this precious intellectual prism" in option C links with "ability to perceive reality from the aesthetic standpoint" mentioned in the penultimate sentence. Option C is the correct answer.

Option D: "theoretical capacities" may seem like a distractor. "contingencies" means 'provisions'. So, while the first part of option D may appear to connect with the penultimate sentence, the second part with the comparison "rather than" is totally out of the blue. "objective intransigence" would need more substantiation. Option D is not the answer.

Choice (C)

Q28. DIRECTIONS for question 28: 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. But the paleontological equivalent of finding royal jewels is the discovery of soft tissues that have themselves become preserved through pyritisation, whereby pyrite, composed of iron sulphide, seeped into the tissues of dead animals and mineralised them, keeping flesh-eating bacteria at bay.
2. Preserved impressions in fine sediment of soft parts like skin and organs are rarer and concomitantly more helpful when it comes to understanding what ancient life was like.
3. Fossilised bones, while useful, are reasonably common.
4. For palaeontologists, fossils are buried treasure, and, like treasure of the more conventional sort, such fossil finds are not all of equal value.

Sentence 1: Sentence 1 throws light on "soft tissues that have themselves become preserved".

Sentence 2: Sentence 2 mentions an opinion about the impressions of soft parts like skin and organs. The comparative degree of comparison "rarer and concomitantly more helpful" indicates that there is a comparison made with something else and that needs to be described in another sentence.

Sentence 3: Sentence 3 makes a comment about fossilised bones.

Sentence 4: Sentence 4 can serve as an introductory sentence of the para. It tells us what palaeontologists think of fossils.

Sentence 4 is a general sentence that begins the paragraph. It tells us how paleontologists perceive fossils. It also mentions an important point: fossil finds are not all of equal value. Sentence 4 is followed by sentence 3 which talks about fossilised bones. "useful and reasonably common" in sentence 3 provide a **positive** degree of comparison and should be the first sentence to expand on how "fossil finds are not all of equal value" mentioned in sentence 4. So sentence 3 follows sentence 4.

Sentence 3 is followed by sentence 2. Sentence 2 talks about preserved impressions in fine sediment of soft parts like skin and organs. "rarer and concomitantly more helpful" in sentence 2 provide a **comparative** degree of comparison and should be the second sentence to expand on how "fossil finds are not all of equal value" mentioned earlier in sentence 4.

Sentence 2 is followed by sentence 1. Sentence 1 mentions "soft tissues that have themselves become preserved through pyritisation". Sentence 1 employs the superlative degree of comparison when it mentions "finding royal jewels". Sentence 1 (paleontological equivalent of finding royal jewels is the discovery of ...) mirrors the introductory sentence 4 (For palaeontologists, fossils are buried treasure). So, 4321.

Ans: (4321)

Q29. DIRECTIONS for questions 29 to 31: The following question has a paragraph from which the last sentence has been deleted. From the given options, choose the one that completes the paragraph in the most appropriate way.

To portray the future in the language of the present may well be to betray it. A truly radical change would defeat the categories we currently have to hand. If we can speak of the future at all, it follows that we are still tied to some extent to the present. This is one reason why Marx, who began his career in contention with the middle-class utopianists, steadfastly refused to engage in future-talk. The most a revolutionary could do was to describe the conditions under which a different sort of future might be possible. To stipulate exactly what it might look like was to programme freedom. If Marx was a prophet, it was not because he sought to foresee the future. Prophets aren't clairvoyants. Rather than gaze into the future, they warn you that unless you feed the hungry and welcome the immigrant, there isn't going to be one. Or if there is, it will be deeply unpleasant. The real soothsayers are those hired by the big corporations to peer into the entrails of the system and

assure their masters that their profits are safe for another 30 years.

- a) After all, we live in a world that seeks to extend its sovereignty even over what doesn't yet exist.
- b) Perhaps it is impossible to draw a line between being agnostic about the future and being too assured about it.
- c) In any case, the energies we invest in envisaging a better world might consume the energies we need to create it.
- d) **The acceleration of change radically alters the balance between novel and familiar situations.**

Option A: Note the idiom "have to hand" in the second sentence of the para. If you have something to hand or near to hand, you have it with you or near you.

The para necessarily highlights "portraying the future". The second part of the para seems to differentiate between prophets who don't really gaze into the future (but just predict a future that is absent or unpleasant) and the real soothsayers who assure the corporations of big profits for the long-term. It also mentions two important points:

1. A truly radical change would defeat the categories we currently have to hand.
2. The most a revolutionary could do was to describe the conditions under which a different sort of future might be possible.

So option A would be the best sentence to complete the para. "extend its sovereignty even over what doesn't yet exist" in option A links with "peer into the entrails of the system and assure their masters that their profits are safe for another 30 years" given in the penultimate sentence. Option A also mirrors the introduction "portray the future".

Option B: Option B mentions a debatable situation – being too agnostic about the future and being too assured about it. This point of view is an extension of the given paragraph and may come in a paragraph downstream of the question paragraph. Option B cannot complete the paragraph. It does not connect with the penultimate paragraph. It needs a precedent and substantiation.

Option C: "envisaging a better world" in option C seems to connect with the penultimate sentence of the paragraph and the introduction sentence (portray the future....). But "in any case" in option C needs a precedent which is not provided by the penultimate sentence of the paragraph. Also "might consume the energies we need to create it" would need substantiation. Overall, option C cannot close the given paragraph. The focus is on "energies" which abruptly starts off a new discussion and option C therefore goes on a tangent.

Option D: The para only talks about portraying or presenting or envisaging the future. Option D talks about 'acceleration of change' which is out of context. "balance between novel and familiar situations" in option D may point to "different sort of future might be possible" given in the middle of the paragraph. But option D does not further the view of the last two lines of the paragraph, just before the blank. Option D is not the answer.

Choice (A)

Q30. DIRECTIONS for questions 29 to 31: The following question has a paragraph from which the last sentence has been deleted. From the given options, choose the one that completes the paragraph in the most appropriate way.

The assumption that inefficient forms of behaviour are selected out is called the survivor principle.

When Alchian articulated the survivor principle in 1950, mainstream economic theory was widely criticised for its unrealistic representation of human decision making. Critics argued that economic actors had neither the information nor the processing capabilities assumed in standard models and did not think in terms of marginal analysis. Alchian countered that even if neoclassical models do not describe how people actually behave, they can still make accurate predictions, for two reasons.

Firms making negative profits must either take corrective measures or lose resources and ultimately go out of business, while firms earning profits will acquire resources and grow.

- a) Furthermore, the profit motive provides strong incentives for less successful firms to imitate the more successful firms.
- b) However, there is a ceiling to how much a firm can grow as a profit-making entity.
- c) Also, neoclassical models cannot quite explain at what point resources start flowing from firms that are making losses to those that are making profits.
- d) **In other words, the markets punish inefficiency and reward the efficient.**

Option A: The option starts with a positive connector 'Furthermore' which is apt. It gives a new angle, different from the penultimate sentence of the para, thus closing the loop of the para, which **needs to give us two reasons** why Alchian thought neoclassical models can make accurate predictions. Hence, Option A is the answer.

Option B: This provides a counter to the previous sentence, before the blank. That leaves the para incomplete because the antepenultimate line mentions that there are two reasons why neoclassical models can still make accurate predictions. Hence, Option B is not the answer.

Option C: This option starts with a positive connector 'also' but continues that neoclassical models cannot explain at what point resources start flowing out of inefficient firms. This contradicts the second half of the para that argues in favor of neoclassical models. Hence, Option C is not the answer.

Option D: While this explains the penultimate sentence, it still leaves the para incomplete as the closure can only be provided by another reason why neoclassical models could make predictions accurately. Hence, Option D is not the answer.

Choice (A)

Q31. DIRECTIONS for questions 29 to 31: The following question has a paragraph from which the last sentence has been deleted. From the given options, choose the one that completes the paragraph in the most appropriate way.

The consumer society is so all-pervasive today that it is easy to assume it has always existed. Yet, in reality, it is one of the more recent innovations that propelled the West ahead of the Rest. Its most striking characteristic is its seemingly irresistible appeal. Unlike modern medicine, which was often imposed by force on Western colonies, the consumer society is a killer application the rest of the world has generally yearned to download. Even those social orders explicitly intended to be anti-capitalist – most obviously the various derivatives of the doctrine of Karl Marx – have been unable to exclude it. The result is one of the greatest paradoxes of modern history.

- a) An economic system designed to offer infinite choice to the individual has ended up homogenizing humanity.
- b) Consumer society, which had to be forced to adopt modern medicine, voluntarily chose to propagate a killer application.
- c) It is anti-capitalism that drove humanity towards capitalism.
- d) **What was thought to have existed for all of humanity was its most recent innovation.**

Option A: Infinite choice and homogenizing humanity represent one of the greatest paradoxes of human history. It is because the consumer culture is all about giving human beings choice. However, it is all-pervasive now, which means entire humanity is subscribing to the culture, the same practise. So, a good ending to the para is something that gives this phenomenon a term – homogenizing humanity. Hence, Option A is the answer.

Option B: Consumer society voluntarily chose to propagate a killer application. That is a paradox – the contradiction, that elaborates the previous sentence and thereby, closes the para loop. According to the author modern medicine was for general good and yet, people didn't willingly adopt it. However, there is too much rhetoric in the last line – 'killer application' is a metaphor. Secondly, modern medicine was mentioned as an example of how people didn't propagate something that was of use and are propagating something they shouldn't. But modern medicine is not a central theme of discussion in the para and shouldn't be present in the last line. Hence, Option B is not the answer.

Option C: The argument in the para is not between anti-capitalism and capitalism and what led to which. Also, 'even those' clearly suggests that the issue of anti-capitalism is added in the para as an added example, an afterthought. Hence, Option C is not the answer.

Option D: While this distinction has been mentioned, it was done in the first half of the para. So, the last line of the para doesn't really end with the same idea, virtually ignoring the thoughts in the second half of the para – which talks about how consumer society has been propagated by choice and not by compulsion. Choice (A)

Q32. DIRECTIONS for question 32: 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. One of the important points made in 'A War of Songs' is that, despite political tensions, Russians and Ukrainians continue to listen to each other's music and, indeed, vote for each other in the Eurovision Song Contest.
2. The analysis of popular music allows the reader to tap into much deeper issues.
3. As a British citizen, this is something I feel very acutely in 2019.
4. You cannot identify people with the actions of their governments.

Sentence 1 is an independent sentence - a theory about 'A War of Songs' that people from two countries with tensions between them follow each other's music.

Sentence 2 is an independent sentence too, which connects music with deeper issues. Sentence 3 uses the demonstrative pronoun 'this', to connect something with the opinion of a British citizen.

Sentence 4 is another theory sentence that separates people from governments.

So, 4 and 1 are obviously connected. But, 1 comes before 4 (even though it is more of an example, and examples come after the theory) because 1 has the introduction phrase 'one of the important points'. So, 14 is a logical block.

Now, if a British citizen feels something very acutely in 2019, it is more likely to be another theory in the para about countries. So, 3 will follow the 14 block. That leaves us with 2. It could precede 143 or follow 143. However, it is a much bigger and generic idea – connecting popular music with deeper issues – one of the examples being how people and governments are different and how music shows that (one of the deeper issues). So, the order is 2143.

Ans: (2143)

Q33. DIRECTIONS *for questions 33 and 34*: The following question has a set of four sequentially ordered statements. Classify the statements into Facts, Inferences and Judgements based on the following criteria:

- Facts, which deal with pieces of information that one has seen, heard or read; which are known matters of direct observation or existing reality; which are open to discovery or verification (The answer option represents such a statement with an 'F')
- Inferences, which are logical conclusions or deductions drawn about the unknown, on the basis of the known i.e. based on the knowledge of facts (The answer option represents such a statement with an 'I')
- Judgments, which are opinions, or recommendations or estimates or anticipations of common sense or intention that imply approval or disapproval of persons, objects, situations and occurrences in the past, the present or the future The answer option represents such a statement with a 'J')

Select the answer option that best describes the set of statements.

- i. When most governments and organizations talk about energy consumption, they are referring to a metric called primary energy consumption, which represents the direct use of energy sources without any prior conversions or transformations.
- ii. Primary forms of energy are not useful on their own, so they are converted and transformed into secondary forms of energy.

- iii. The secondary sources can also be converted into other tasks and end uses, collectively known as tertiary sources.
- iv. However, it must be emphasized that all primary energy sources are themselves the result of earlier conversions and transformations in nature, so they are not so primary after all.

a) FIFI

b) JJFJ

c) FJJI

d) FIFJ

Statement 1 talks about a definition – that of primary energy consumption. Hence, it is a verifiable statement, a Fact. So, F

Statement 2 represents two ideas, with the second derived from the first (hence the word 'so'). So, it is an Inference. Hence – I.

Statement 3 gives a definition again, of tertiary sources, into which secondary sources can be converted into. This is a verifiable statement. Hence, it is Fact – F

Statement 4 again combines two statements, one of which (the second) is derived from the first. Hence, it is an Inference – I.

The correct answer is FIFI.

Choice (A)

Q34. DIRECTIONS for questions 33 and 34: The following question has a set of four sequentially ordered statements. Classify the statements into Facts, Inferences and Judgements based on the following criteria:

- Facts, which deal with pieces of information that one has seen, heard or read; which are known matters of direct observation or existing reality; which are open to discovery or verification (The answer option represents such a statement with an 'F')
- Inferences, which are logical conclusions or deductions drawn about the unknown, on the basis of the known i.e. based on the knowledge of facts (The answer option represents such a statement with an 'I')
- Judgments, which are opinions, or recommendations or estimates or anticipations of common sense or intention that imply approval or disapproval of persons, objects, situations and occurrences in the past, the present or the future The answer option represents such a statement with a 'J')

Select the answer option that best describes the set of statements.

- i. A fatal blast, in Sarov, one of Russia's secret cities that's closed off to foreigners, killed five nuclear specialists at a military test site last week in northern Russia.
- ii. According to a Russian official account, five elite nuclear scientists were killed during tests on a liquid propulsion system involving isotopes, but other information seems to deepen the mystery rather than solve it.
- iii. Putting it all together experts believe the test most likely had some nuclear dimension.
- iv. But given the Russian government's characteristic secrecy, it's not clear how much more we'll learn about the cause -- or the possible effects -- of the blast.

a) FFII

b) FJFI

c) JFJJ

d) **FJIF**

Statement (i) talks about a fatal blast killing five nuclear scientists – verifiable. Hence, it is a Fact – F.

Statement (ii) talks about a Russian report, which is verifiable, but the second part talks about how other information deepens the mystery – an opinion, whose source we do not know. So, it is a Judgment – J.

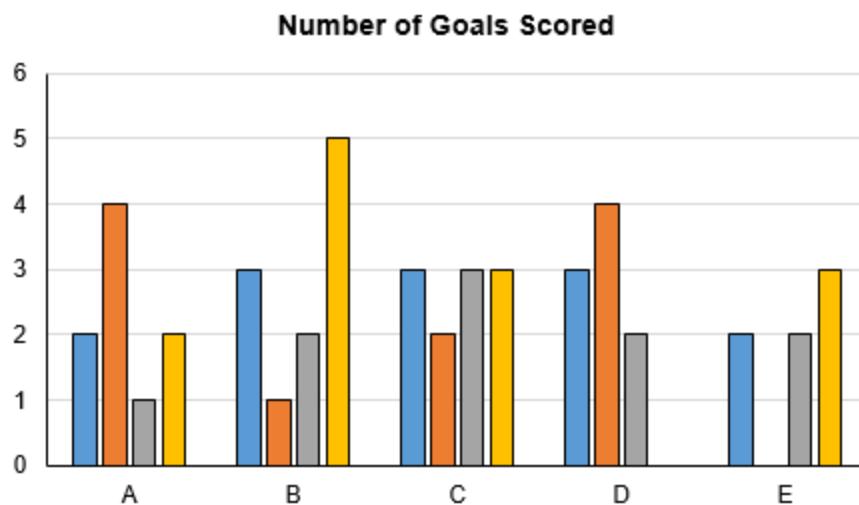
Statement (iii) talks about how experts have put the information together and come to an inference. So, the experts have inferred. However, the overall statement is verifiable – as it can be found out what the experts believe. So, it is a Fact – F.

Statement (iv) talks about two ideas, where the second idea relies on the first. It is not clear because the Russian government is maintaining secrecy. Hence, this is an Inference – I.

The correct answer is FJFI.

Choice (B)

DIRECTIONS for questions 1 to 4: Answer the questions on the basis of the information given below. Five teams, A through E, participated in a football tournament, in which each team played against each of the other teams exactly once. The graph below provides the number of goals scored by each team in each match that it played, not necessarily in the same order. If, for any team, any bar is missing, it indicates that the team did not score any goal in one of the matches.



Q1. DIRECTIONS for question 1: Select the correct alternative from the given choices.
If A drew all the matches that it played and B won three of the four matches that it played, how many matches did C definitely not lose?

- a) 3
- b) 4
- c) 2
- d) 1

The following table provides the number of goals that each team scored in the matches in the tournament:

A	2	4	1	2
B	3	1	2	5
C	3	2	3	3
D	3	4	2	0
E	2	0	2	3

Given that A drew all the matches that it played.

For A to draw the match in which it scored 4 goals, it must have played this match against D (the only other team to have scored 4 goals in a match).

For A to draw the match in which it scored 1 goal, it must have played this match against B (the only other team to have scored 1 goal in a match).

Hence, A must have scored 2 goals against each of C and E. Each of C and E must also have scored 2 goals against A.

Since B won three of the four matches and it drew against A, B must have won against C, D and E.

B would have scored 3, 2 and 5 goals in the remaining three matches.

For B to win the match in which it scored 2 goals, the opponent must have scored 0 goals or 1 goal. By observation, we can see that, apart from A (against which B drew), no other team scored 1 goal. Hence, in the match that B scored 2 goals, the opponent must have scored 0 goals. Since only D and E scored 0 goals in a match, B must have played this match against D or E.

In the match in which B scored 3 goals, the opponent must have scored 0 goals, 1 goal or 2 goals. B could not have played this match against C as C could not have scored

2 goals against B (the only instance of C scoring 2 goals was against A). Hence, B must have played this match against D or E. In this match, D or E could have scored 2 goals or 0 goals.

Hence, the only match that B could play against C is the match in which B scored 5 goals. In this match C must have scored 3 goals.

C must have scored 3 goals against D and E (since C scored 3 goals against three teams).

Both D and E could have scored 3 or 2 or 0 goals against C. Hence, C could not have lost both these matches.

Hence, C drew against A, lost to B but definitely won against two teams, D and E.

∴ C did not lose three of the four matches that it played. Choice (A)

Q2. DIRECTIONS for questions 2 and 3: Type in your answer in the input box provided below the question.

In each match that B played, it scored one goal more than its opponent.

What is the maximum number of matches that A could have won?

The following table provides the number of goals that each team scored in the matches in the tournament:

A	2	4	1	2
B	3	1	2	5
C	3	2	3	3
D	3	4	2	0
E	2	0	2	3

B scored 3, 1, 2 and 5 goals against its opponents. Hence, the teams that played against B in these four matches must have scored 2, 0, 1 and 4 goals, respectively.

The only team that scored 1 goal (apart from B) is A.

Hence, in the match between B and A, B must have scored 2 goals and A, 1 goal.

Among the remaining teams, the only team that scored 4 goals is D.

Hence, in the match between B and D, B must have scored 5 goals and D must have scored 4 goals.

Among the remaining teams, the only team that scored 0 goals is E. Hence, in the match between B and E, B must have scored 1 goal and E must have scored 0 goals.

In the match between B and C, B must have scored 3 goals and C must have scored 2 goals.

Since C scored 2 goals against B, C must have scored 3 goals against each of A, D and E.

In all the other matches that A played, A must have scored 2 goals or 4 goals.

Similarly, E must have scored 2 goals or 3 goals.

In the match between A and C, C would have scored 3 goals and A would have scored 2 or 4 goals.

In the match between A and D, A would have scored 2 or 4 goals and D would have scored 0 or 2 or 3 goals.

In the match between A and E, A would have scored 2 or 4 goals and E would have scored 2 or 3 goals.

A can win the matches against C and D but cannot win against E. Hence, the maximum number of matches that A can win is 2. Ans: (2)

Q3. DIRECTIONS for questions 2 and 3: Type in your answer in the input box provided below the question.

In each match that B played, it scored one goal more than its opponent.

If C did not win any match that it played, what is the total number of goals scored by A and E combined in the match that they played against each other?

The following table provides the number of goals that each team scored in the matches in the tournament:

A	2	4	1	2
B	3	1	2	5
C	3	2	3	3
D	3	4	2	0
E	2	0	2	3

From the above solution, C must have scored 3 goals against each of A, D and E.
For C not to win against A, A must have scored 4 goals.
For C not to win against E, E must have scored 3 goals.
For C not to win against D, D must have scored 3 goals.
A must have scored 2 goals against D and E.
E must have scored 2 goals against A and D.
Hence, in the match between A and E, both the teams must have scored 2 goals each,
scoring a total of 4 goals.

Ans: (4)

Q4. DIRECTIONS *for question 4*: Select the correct alternative from the given choices.

In each match that B played, it scored one goal more than its opponent.

If a total of 11 goals were scored against A by all the other teams in the tournament, at most how many matches could C have won in the tournament?

- a) 2
- b) 3
- c) 1
- d) 0

The following table provides the number of goals that each team scored in the matches in the tournament:

A	2	4	1	2
B	3	1	2	5
C	3	2	3	3
D	3	4	2	0
E	2	0	2	3

From the above solution, B scored 2 goals against A and C must have scored 3 goals against A.

Since a total of 11 goals were scored against A, D and E must have scored 6 goals against A. This is possible only if each of D and E scored 3 goals against A.

Hence, in the match between A and C, A would have scored 2 or 4 goals, and C would have scored 3 goals.

In the match between C and E, C would have scored 3 goals and E must have scored 2 goals.

In the match between C and D, C would have scored 3 goals and D must have scored 0 or 2 goals.

Hence, C could have won three matches, i.e., the matches against A, D and E.

Choice (B)

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

Satish developed a robot which can pick up marbles scattered across the floor of any room. It does this based on the relative positions of the marbles, which it figures out using the latest Image Recognition Technology. The robot first calculates the horizontal distance (i.e., the distance along the length of the room) and the vertical distance (i.e., the distance along the breadth of the room) between each pair of marbles, after which it zeroes in on the path it will follow to pick up all the marbles. While picking up the marbles, the robot is programmed to travel only horizontally or vertically.

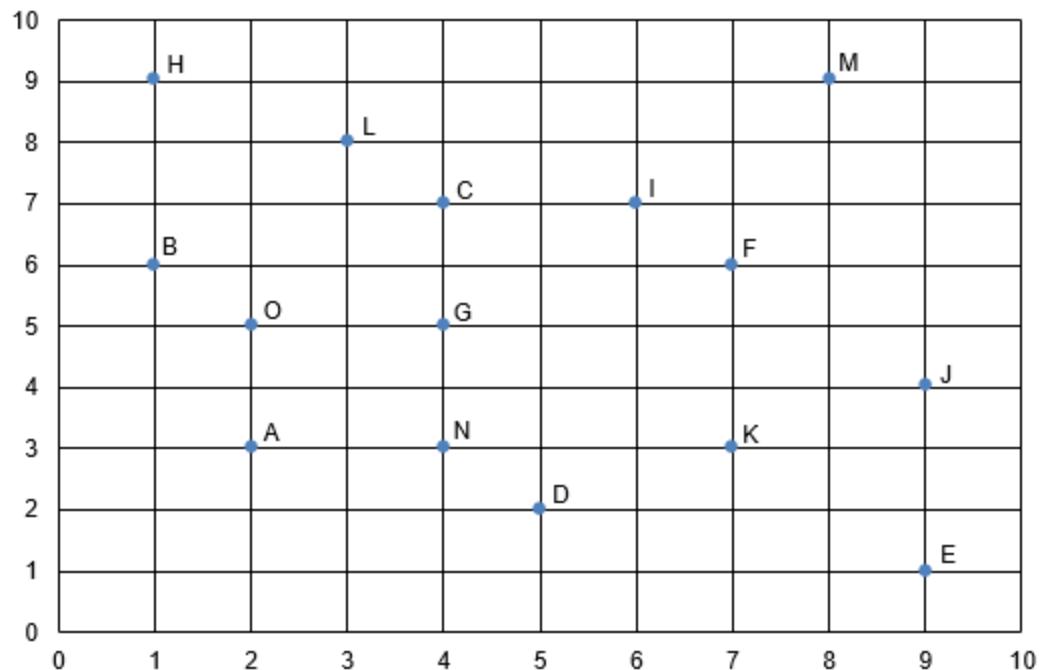
Satish must load one of the following two algorithms in the robot for picking up the marbles:

Optimal Horizontal Algorithm: From any point, the robot travels to and picks up the marble to which the horizontal distance is minimum. If the horizontal distance is minimum for more than one marble, the robot travels to and picks up the marble among them to which the vertical distance is minimum.

Optimal Vertical Algorithm: From any point, the robot travels to and picks up the marble to which the vertical distance is minimum. If the vertical distance is minimum for more than one marble, the robot travels to and picks up the marble among them to which the horizontal distance is minimum.

The figure given below provides the positions of fifteen marbles, labelled A through O, that were scattered on the floor of a room. The horizontal and vertical axes of the figure represent the length and breadth of the room, respectively, and each unit along the horizontal and vertical axes represents a distance of one metre.

The robot is initially at (0, 0).



Q5. DIRECTIONS for questions 5 and 6: Select the correct alternative from the given choices.
 Which of the following marbles will the robot definitely pick up before it picks up marble G, irrespective of the algorithm that Satish loads?

- a) O
- b) L

c) A

d) B

According to *Optimal Horizontal Algorithm*, the robot calculates the horizontal distances between each pair of marbles.

Since the robot is initially present at (0, 0), the marbles which have the minimum horizontal distance from this point are B and H. Between B and H, the robot will reach the marble which has the minimum vertical distance. Since B has a lower vertical distance than H, the robot will pick up B, first and then pick up H.

From H, the marbles which have the minimum horizontal distance are O and A. Between O and A, the robot will reach O first followed by A.

From A, the robot will travel to L (since this is only marble which has the minimum horizontal distance from A).

From L, the robot will travel to C, G and N, in that order. From N, the robot will travel to D. From D, it will travel to I. From I it will travel to F and K, in that order. From K, the robot will travel to M, followed by J and E in that order.

Hence, the order in which the robot will pick up the marbles according to *Optimal Horizontal Algorithm* is B-H-O-A-L-C-G-N-D-I-F-K-M-J-E.

According to *Optimal Vertical Algorithm*, the robot will pick up E first, since it has the minimum vertical distance.

From E, the robot will travel to D, since the vertical distance between E and D is the minimum possible.

From D, the marbles, A, N and K, all have the same vertical distance. But between A, N and K, the horizontal distance from D is the minimum for N. Hence, it will travel to N from D. From N, the robot will travel to A, followed by K. From K, the robot will travel to J, followed by G and O, in that order. Similarly, we can chart the further path of the robot to be B, F, I, C, L, H and M,

Hence, the order in which the robot will pick up the marbles according to *Optimal Vertical Algorithm* is E-D-N-A-K-J-G-O-B-F-I-C-L-H-M.

The following table provides the order in which the robot picks up the marbles according to *Optimal Horizontal Algorithm* (OAH) and *Optimal Vertical Algorithm* (OVH):

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
OHA	B	H	O	A	L	C	G	N	D	I	F	K	M	J	E
OVA	E	D	N	A	K	J	G	O	B	F	I	C	L	H	M

Using either algorithm, the robot will definitely pick up A before it picks up G.

Choice (C)

Q6. DIRECTIONS for questions 5 and 6: Select the correct alternative from the given choices.

Satish removed a certain number of marbles from the floor before loading any algorithm in the robot.

If the first marble that the robot picks up will be the same, irrespective of the algorithm that Satish loads, what is the minimum number of marbles that Satish removed?

a) 4

b) 5

c) 6

d) **8**

According to *Optimal Horizontal Algorithm*, the robot calculates the horizontal distances between each pair of marbles.

Since the robot is initially present at (0, 0), the marbles which have the minimum horizontal distance from this point are B and H. Between B and H, the robot will reach the marble which has the minimum vertical distance. Since B has a lower vertical distance than H, the robot will pick up B, first and then pick up H.

From H, the marbles which have the minimum horizontal distance are O and A. Between O and A, the robot will reach O first followed by A.

From A, the robot will travel to L (since this is only marble which has the minimum horizontal distance from A).

From L, the robot will travel to C, G and N, in that order. From N, the robot will travel to D. From D, it will travel to I. From I it will travel to F and K, in that order. From K, the robot will travel to M, followed by J and E in that order.

Hence, the order in which the robot will pick up the marbles according to *Optimal Horizontal Algorithm* is B-H-O-A-L-C-G-N-D-I-F-K-M-J-E.

According to *Optimal Vertical Algorithm*, the robot will pick up E first, since it has the minimum vertical distance.

From E, the robot will travel to D, since the vertical distance between E and D is the minimum possible.

From D, the marbles, A, N and K, all have the same vertical distance. But between A, N and K, the horizontal distance from D is the minimum for N. Hence, it will travel to N from D. From N, the robot will travel to A, followed by K. From K, the robot will travel to J, followed by G and O, in that order. Similarly, we can chart the further path of the robot to be B, F, I, C, L, H and M,

Hence, the order in which the robot will pick up the marbles according to *Optimal Vertical Algorithm* is E-D-N-A-K-J-G-O-B-F-I-C-L-H-M.

The following table provides the order in which the robot picks up the marbles according to *Optimal Horizontal Algorithm* (OAH) and *Optimal Vertical Algorithm* (OVA):

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
OHA	B	H	O	A	L	C	G	N	D	I	F	K	M	J	E
OVA	E	D	N	A	K	J	G	O	B	F	I	C	L	H	M

For the first marble that the robot picked up using either algorithm to be the same, by observation, we can see that the 4th marble that the robot picks up in either case is A. We can remove B, H and O for A to be the first marble that the robot picks up. However, by removing B and H, the robot will pick up A and not O as A is closer to (0, 0), according to OHA.

Similarly, by removing E and D, the robot will pick up A and not N, as A is closer to (0, 0), according to OVA.

We can check if any other marble, say X, can become the first by removing a lesser number of marbles. For this to happen, X can be at most the fifth marble that the robot picks up using either algorithm. If it is greater than fifth, then Satish will have to remove more than 4 marbles to make it first, for that algorithm.

In the table, we can see that the marbles which in in the first 5 positions in one algorithm are not in the first 5 positions in the other algorithm. Hence, we can conclude that for any other marble, more than 4 marbles have to be removed.

∴ The minimum number of marbles that must be removed is 4.

Choice (A)

Q7. DIRECTIONS for questions 7 and 8: Type in your answer in the input box provided below the question.

Satish removed a certain number of marbles from the floor before loading any algorithm in the robot.

If the ninth marble that the robot picks up will be the same, irrespective of the algorithm that Satish loads, what is the minimum number of marbles that Satish removed?

According to *Optimal Horizontal Algorithm*, the robot calculates the horizontal distances between each pair of marbles.

Since the robot is initially present at (0, 0), the marbles which have the minimum horizontal distance from this point are B and H. Between B and H, the robot will reach the marble which has the minimum vertical distance. Since B has a lower vertical distance than H, the robot will pick up B, first and then pick up H.

From H, the marbles which have the minimum horizontal distance are O and A. Between O and A, the robot will reach O first followed by A.

From A, the robot will travel to L (since this is only marble which has the minimum horizontal distance from A).

From L, the robot will travel to C, G and N, in that order. From N, the robot will travel to D. From D, it will travel to I. From I it will travel to F and K, in that order. From K, the robot will travel to M, followed by J and E in that order.

Hence, the order in which the robot will pick up the marbles according to *Optimal Horizontal Algorithm* is B-H-O-A-L-C-G-N-D-I-F-K-M-J-E.

According to *Optimal Vertical Algorithm*, the robot will pick up E first, since it has the minimum vertical distance.

From E, the robot will travel to D, since the vertical distance between E and D is the minimum possible.

From D, the marbles, A, N and K, all have the same vertical distance. But between A, N and K, the horizontal distance from D is the minimum for N. Hence, it will travel to N from D. From N, the robot will travel to A, followed by K. From K, the robot will travel to J, followed by G and O, in that order. Similarly, we can chart the further path of the robot to be B, F, I, C, L, H and M.

Hence, the order in which the robot will pick up the marbles according to *Optimal Vertical Algorithm* is E-D-N-A-K-J-G-O-B-F-I-C-L-H-M.

The following table provides the order in which the robot picks up the marbles according to *Optimal Horizontal Algorithm* (OAH) and *Optimal Vertical Algorithm* (OVA):

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
OHA	B	H	O	A	L	C	G	N	D	I	F	K	M	J	E
OVA	E	D	N	A	K	J	G	O	B	F	I	C	L	H	M

The ninth marble that the robot picks up using OHA is D, while the ninth marble that the robot picks up using OVA is B.

Since Satish only removed marbles and did not add any, B cannot become the ninth marble, as per OHA (as it is the first marble and no marbles were added). Similarly, D cannot become the ninth marble according to OVA (as it is the second marble).

Hence, for any marble to be the ninth marble as per both the algorithms, at least 8 marbles must have been picked up before that marble as per each of the two algorithms.

From the table, we can see that the marbles which satisfy this condition are I, F and M. I is the 10th marble according to OHA. For I to become the ninth marble, according to OHA, one marble, which is between first and ninth positions, must be removed. Hence, one of B, H, O, A, L, C, G, N and D must be removed.

I is the 11th marble according to OVA. For I to become the ninth marble according to OVA, two marbles, which are between first and tenth, must be removed. Hence, two among E, D, N, A, K, J, G, O, B and F must be removed.

To minimize the number of marbles to be removed, we can consider a marble which is common to both the sets. For example, if we remove D and K or J or N, then I will become the 9th marble in both the cases.

Hence, for I, a minimum of 2 marbles need to be removed.

Similarly, for F, two marbles as per OHA, and one marble as per OVA must be removed. In this case also, by removing two marbles (say, G and L), F can become the ninth marble as per both the algorithms.

For M to be the ninth marble, at least 6 marbles must be removed (since M is the 15th marble according to OVA).

∴ The minimum number of marbles that must be removed is 2.

Ans: (2)

Q8. DIRECTIONS *for questions 7 and 8*: Type in your answer in the input box provided below the question.

Satish removed a certain number of marbles from the room before loading any algorithm in the robot.

If, for any n , the n^{th} marble that the robot picks up according to *Optimal Horizontal Algorithm* will be the same as that according to *Optimal Vertical Algorithm*, what is the minimum number of marbles that Satish removed?

According to *Optimal Horizontal Algorithm*, the robot calculates the horizontal distances between each pair of marbles.

Since the robot is initially present at (0, 0), the marbles which have the minimum horizontal distance from this point are B and H. Between B and H, the robot will reach the marble which has the minimum vertical distance. Since B has a lower vertical distance than H, the robot will pick up B, first and then pick up H.

From H, the marbles which have the minimum horizontal distance are O and A. Between O and A, the robot will reach O first followed by A.

From A, the robot will travel to L (since this is only marble which has the minimum horizontal distance from A).

From L, the robot will travel to C, G and N, in that order. From N, the robot will travel to D. From D, it will travel to I. From I it will travel to F and K, in that order. From K, the robot will travel to M, followed by J and E in that order.

Hence, the order in which the robot will pick up the marbles according to *Optimal Horizontal Algorithm* is B-H-O-A-L-C-G-N-D-I-F-K-M-J-E.

According to *Optimal Vertical Algorithm*, the robot will pick up E first, since it has the minimum vertical distance.

From E, the robot will travel to D, since the vertical distance between E and D is the minimum possible.

From D, the marbles, A, N and K, all have the same vertical distance. But between A, N and K, the horizontal distance from D is the minimum for N. Hence, it will travel to N from D. From N, the robot will travel to A, followed by K. From K, the robot will travel to J, followed by G and O, in that order. Similarly, we can chart the further path of the robot to be B, F, I, C, L, H and M.

Hence, the order in which the robot will pick up the marbles according to *Optimal Vertical Algorithm* is E-D-N-A-K-J-G-O-B-F-I-C-L-H-M.

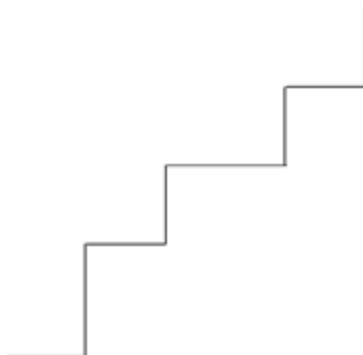
The following table provides the order in which the robot picks up the marbles according to *Optimal Horizontal Algorithm* (OAH) and *Optimal Vertical Algorithm* (OVA):

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
OHA	B	H	O	A	L	C	G	N	D	I	F	K	M	J	E
OVA	E	D	N	A	K	J	G	O	B	F	I	C	L	H	M

From the given information, we can infer that the robot has to pick up the marbles in the same order, as per either of the two algorithms.

One of the ways in which this can happen is if all the marbles lie on a straight line. In this case, the order will not change.

However, if the lines joining the marbles are along a step function (as given in the figure below), even then the robot will pick up the marbles in the same order.



From the graph, we can see that the maximum number of marbles that can be fit into a shape like this is when we consider A, O, G, C, I and M (OR) A, N, G, C, I and M.

In either case, the maximum number of marbles that can remain in the room is 6 and hence, a minimum of 9 marbles must be removed.

Ans: (9)

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

Each of the three students – Abhijit, Dheeraj and Mohit - wrote exams on three subjects – Maths, Physics and Chemistry. After the results are out, it is found that:

- i. two students passed in Maths, one in physics and one in Chemistry.
- ii. Dheeraj passed in Maths but failed in Chemistry.
- iii. Mohit failed in Maths and Abhijit failed in Physics.
- iv. every student passed in at least one subject.

Q9. DIRECTIONS *for questions 9 to 12*: Select the correct alternative from the given choices. If both the students who failed in Physics also failed in Chemistry, then which of the following statements is *definitely true*?

- a) Dheeraj passed in Physics.
- b) Mohit passed in Maths.
- c) Mohit failed in Chemistry.
- d) Abhijit failed in Chemistry.

From the given information

	Maths	Physics	Chemistry
Abhijit	✓	*	
Dheeraj	✓		*
Mohit	*		
Total	2	1	1

(As the total number of students passed in maths is two, Abhijit must have definitely passed in Maths.)

It is given that both the students who failed in Physics also failed in Chemistry, hence the student who passed in Physics must also have passed in Chemistry. That student must be Mohit. Hence the final table is as follows.

	Maths	Physics	Chemistry
Abhijit	✓	*	*
Dheeraj	✓	*	*
Mohit	*	✓	✓

From the above table, only statement (D) is true.

Choice (D)

Q10. DIRECTIONS for questions 9 to 12: Select the correct alternative from the given choices.
If Mohit passed in Physics, then which of the following statements *could be true*?

- a) Each of Dheeraj and Mohit passed in exactly one subject. ✓ Your answer is correct
- b) Each of Mohit and Abhijit passed in exactly one subject.
- c) Dheeraj passed in exactly two subjects.
- d) Dheeraj failed in Maths.

From the given information

	Maths	Physics	Chemistry
Abhijit	✓	*	
Dheeraj	✓		*
Mohit	*		
Total	2	1	1

(As the total number of students passed in maths is two, Abhijit must have definitely passed in Maths.)

As Mohit passed in Physics, we get the following table.

	Maths	Physics	Chemistry
Abhijit	✓	*	
Dheeraj	✓	*	*
Mohit	*	✓	

From the above table, only (A) could be true.

Choice (A)

Q11. DIRECTIONS for questions 9 to 12: Select the correct alternative from the given choices.
Which of the following statements *could be true*?

- a) Dheeraj and Mohit failed in Physics.
- b) Mohit and Abhijit passed in Maths.
- c) Mohit and Abhijit failed in Chemistry.
- d) Dheeraj passed in exactly one subject and Mohit passed in exactly two subjects.

From the given information

	Maths	Physics	Chemistry
Abhijit	✓	*	
Dheeraj	✓		*
Mohit	*		
Total	2	1	1

(As the total number of students passed in maths is two, Abhijit must have definitely passed in Maths.)

From the given information,

- (i) Exactly one of Dheeraj and Mohit passed in Physics, hence (A) cannot be true.
- (ii) Mohit failed in Maths, hence (B) cannot be true.
- (iii) Exactly one of Mohit and Abhijit must have passed in Chemistry, hence (C) cannot be true.
- (iv) Dheeraj could have passed in only Maths and Mohit in Physics and Chemistry. (D) can be true .

Choice (D)

Q12. DIRECTIONS for questions 9 to 12: Select the correct alternative from the given choices.
If Mohit passed in exactly two subjects, which of the following statements is *definitely true*?

- a) Dheeraj passed in Physics.
- b) Mohit failed in Chemistry.
- c) Mohit failed in Physics.
- d) Abhijit failed in Chemistry.

From the given information

	Maths	Physics	Chemistry
Abhijit	✓	✗	
Dheeraj	✓		✗
Mohit	✗		
Total	2	1	1

(As the total number of students passed in maths is two, Abhijit must have definitely passed in Maths.)

Given that Mohit passed in exactly two subjects

	Maths	Physics	Chemistry
Abhijit	✓	✗	✗
Dheeraj	✓	✗	✗
Mohit	✗	✓	✓

From the above table, choice (D) must be true.

Choice (D)

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

Each of three persons, A, B and C, is from a different country among England, Canada and Senegal, not necessarily in the same order. Further, each person drives a different car among Jaguar, BMW and Ferrari. The colours of the cars that the three persons drive are Red, Blue and Green, not necessarily in the same order. Each person wears a watch of a different company among Rolex, Tissot and Omega and each person studied in a different college among Harvard, Yale and Stanford.

It is also known that

- i. the person who drives a Jaguar studied in Yale, while the person who is from Canada did not study in Harvard.
- ii. the person who wears a Rolex did not study in Harvard, while the person who drives a Blue car is not from Senegal.
- iii. B does not drive a Green car, while C does not drive a BMW.
- iv. the person who studied in Harvard does not drive a Red car and is not from England, while the person from England does not drive a Red car.
- v. A, who does not wear Rolex, did not go to Harvard and does not drive a Blue car, while the person who drives a BMW is not from Canada.

Q13. DIRECTIONS for questions 13 to 16: Select the correct alternative from the given choices.

What is the colour of the Ferrari?

- a) **Green**
- b) Red
- c) **Blue**
- d) **Cannot be determined**

From (i), the person who is from Canada did not study in Harvard. Hence, the person who studied in Harvard is not from Canada.

From (iv), the person who studied in Harvard is not from England.

Hence, the person who studied in Harvard must be from Senegal.

From (iv), this person does not drive a Red car. From (ii), the person from Senegal (i.e., the person who studied in Harvard) does not drive a Blue car.

Hence, the person who studied in Harvard must be driving a Green car.

From (iii), B does not drive a Green car. Hence, B cannot be the one who studied in Harvard. From (v), A cannot be the one who studied in Harvard.

Hence, C must be the person who studied in Harvard.

From (iii), C does not drive a BMW. Hence, C must be driving Jaguar or Ferrari. From (i), the person who drives Jaguar studied in Yale. Since C studied in Harvard, he must be driving a Ferrari.

From (v), A does not drive a Blue car. Hence, A must be driving a Red car and B must be driving a Blue car.

From (iv), the person from England does not drive a Red car. Hence, the person from England must be driving the Blue car and the person from Canada must be driving the Red Car, i.e., A must be from Canada and B must be from England.

From (v), the person who is from Canada, i.e., A, does not drive a BMW. Hence, A drives a Jaguar. From (i), A must have studied in Yale.

B drives a BMW and must have studied in Stanford.

From (ii), the person from Harvard, i.e., C, does not wear a Rolex. From (v), A does not wear a Rolex. Hence, B wears a Rolex.

The above information is tabulated as follows:

Person	Country	Car	Colour	Watch	College
A	Canada	Jaguar	Red	Tissot/Omega	Yale
B	England	BMW	Blue	Rolex	Stanford
C	Senegal	Ferrari	Green	Omega/Tissot	Harvard

The Ferrari is Green.

Choice (A)

Q14. DIRECTIONS for questions 13 to 16: Select the correct alternative from the given choices.
Which country is A from?

a) **Senegal**

b) England

c) **Canada**

d) Cannot be determined

From (i), the person who is from Canada did not study in Harvard. Hence, the person who studied in Harvard is not from Canada.

From (iv), the person who studied in Harvard is not from England.

Hence, the person who studied in Harvard must be from Senegal.

From (iv), this person does not drive a Red car. From (ii), the person from Senegal (i.e., the person who studied in Harvard) does not drive a Blue car.

Hence, the person who studied in Harvard must be driving a Green car.

From (iii), B does not drive a Green car. Hence, B cannot be the one who studied in Harvard. From (v), A cannot be the one who studied in Harvard.

Hence, C must be the person who studied in Harvard.

From (iii), C does not drive a BMW. Hence, C must be driving Jaguar or Ferrari. From (i), the person who drives Jaguar studied in Yale. Since C studied in Harvard, he must be driving a Ferrari.

From (v), A does not drive a Blue car. Hence, A must be driving a Red car and B must be driving a Blue car.

From (iv), the person from England does not drive a Red car. Hence, the person from England must be driving the Blue car and the person from Canada must be driving the Red Car, i.e., A must be from Canada and B must be from England.

From (v), the person who is from Canada, i.e., A, does not drive a BMW. Hence, A drives a Jaguar. From (i), A must have studied in Yale.

B drives a BMW and must have studied in Stanford.

From (ii), the person from Harvard, i.e., C, does not wear a Rolex. From (v), A does not wear a Rolex. Hence, B wears a Rolex.

The above information is tabulated as follows:

Person	Country	Car	Colour	Watch	College
A	Canada	Jaguar	Red	Tissot/Omega	Yale
B	England	BMW	Blue	Rolex	Stanford
C	Senegal	Ferrari	Green	Omega/Tissot	Harvard

A is from Canada.

Choice (C)

Q15. DIRECTIONS for questions 13 to 16: Select the correct alternative from the given choices.
Who wears the Tissot?

- a) A
 b) B
 c) C
 d) Cannot be determined

From (i), the person who is from Canada did not study in Harvard. Hence, the person who studied in Harvard is not from Canada.

From (iv), the person who studied in Harvard is not from England.
 Hence, the person who studied in Harvard must be from Senegal.

From (iv), this person does not drive a Red car. From (ii), the person from Senegal (i.e., the person who studied in Harvard) does not drive a Blue car.

Hence, the person who studied in Harvard must be driving a Green car.

From (iii), B does not drive a Green car. Hence, B cannot be the one who studied in Harvard. From (v), A cannot be the one who studied in Harvard.

Hence, C must be the person who studied in Harvard.

From (iii), C does not drive a BMW. Hence, C must be driving Jaguar or Ferrari. From (i), the person who drives Jaguar studied in Yale. Since C studied in Harvard, he must be driving a Ferrari.

From (v), A does not drive a Blue car. Hence, A must be driving a Red car and B must be driving a Blue car.

From (iv), the person from England does not drive a Red car. Hence, the person from England must be driving the Blue car and the person from Canada must be driving the Red Car, i.e., A must be from Canada and B must be from England.

From (v), the person who is from Canada, i.e., A, does not drive a BMW. Hence, A drives a Jaguar. From (i), A must have studied in Yale.

B drives a BMW and must have studied in Stanford.

From (ii), the person from Harvard, i.e., C, does not wear a Rolex. From (v), A does not wear a Rolex. Hence, B wears a Rolex.

The above information is tabulated as follows:

Person	Country	Car	Colour	Watch	College
A	Canada	Jaguar	Red	Tissot/Omega	Yale
B	England	BMW	Blue	Rolex	Stanford
C	Senegal	Ferrari	Green	Omega/Tissot	Harvard

Either C or A wears the Tissot. The answer cannot be determined.

Choice (D)

Q16. DIRECTIONS for questions 13 to 16: Select the correct alternative from the given choices.

Which college did the person who drives the Blue car study in?

- a) **Harvard**
- b) Stanford
- c) **Yale**
- d) **Cannot be determined**

From (i), the person who is from Canada did not study in Harvard. Hence, the person who studied in Harvard is not from Canada.

From (iv), the person who studied in Harvard is not from England.
Hence, the person who studied in Harvard must be from Senegal.

From (iv), this person does not drive a Red car. From (ii), the person from Senegal (i.e., the person who studied in Harvard) does not drive a Blue car.

Hence, the person who studied in Harvard must be driving a Green car.

From (iii), B does not drive a Green car. Hence, B cannot be the one who studied in Harvard. From (v), A cannot be the one who studied in Harvard.

Hence, C must be the person who studied in Harvard.

From (iii), C does not drive a BMW. Hence, C must be driving Jaguar or Ferrari. From (i), the person who drives Jaguar studied in Yale. Since C studied in Harvard, he must be driving a Ferrari.

From (v), A does not drive a Blue car. Hence, A must be driving a Red car and B must be driving a Blue car.

From (iv), the person from England does not drive a Red car. Hence, the person from England must be driving the Blue car and the person from Canada must be driving the Red Car, i.e., A must be from Canada and B must be from England.

From (v), the person who is from Canada, i.e., A, does not drive a BMW. Hence, A drives a Jaguar. From (i), A must have studied in Yale.

B drives a BMW and must have studied in Stanford.

From (ii), the person from Harvard, i.e., C, does not wear a Rolex. From (v), A does not wear a Rolex. Hence, B wears a Rolex.

The above information is tabulated as follows:

Person	Country	Car	Colour	Watch	College
A	Canada	Jaguar	Red	Tissot/Omega	Yale
B	England	BMW	Blue	Rolex	Stanford
C	Senegal	Ferrari	Green	Omega/Tissot	Harvard

The person who drives the Blue car studied in Stanford.

Choice (B)

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

Each of six children, Jai, Kishore, Lokesh, Manish, Ankur and Hem, had a certain amount of money with him among Rs.45, Rs.65, Rs.70, Rs.80, Rs.90 and Rs.100, not necessarily in the same order. They went to a shop and purchased six different chocolates, each of a different price among Rs.30, Rs.40, Rs.50, Rs.90, Rs.110 and Rs.130, in the following manner:

- Each chocolate was paid for by exactly two children, with each of them contributing exactly half the price of the chocolate.

- No child contributed for more than two chocolates.

It is also known that

- each of Manish and Kishore contributed for two chocolates. Among all the children who contributed for two chocolates each, the difference between the amounts contributed for the two chocolates was the highest for Manish and the lowest for Kishore.
- neither Lokesh nor Ankur contributed exactly Rs.55 for any chocolate.
- initially, Hem had at least Rs.20 more than what Ankur had.

Q17. DIRECTIONS *for questions 17 to 20:* Type in your answer in the input box provided below the question.

What is the amount (in Rs.) with Jai before he contributed for any chocolate?

Q18. DIRECTIONS *for questions 17 to 20:* Type in your answer in the input box provided below the question.

What is the difference (in Rs.) between the amounts that Manish contributed for the two chocolates?

Given that the cost of the chocolates are ₹30, ₹40, ₹50, ₹90, ₹110 and ₹130. Also, each chocolate was paid for by exactly two children and the two children each paid half the price of chocolate. Hence, the prices that the children paid for the chocolates will be ₹15, ₹20, ₹25, ₹45, ₹55 and ₹65, each by two children. One of the children has ₹100. Since no child paid for more than two chocolates and there are no chocolates for ₹100, this child must have paid for two chocolates. From the values above, the only possibility for this is if the child with ₹100 paid ₹55 for one chocolate and ₹45 for another chocolate. Another child, say X, must have paid ₹55 for the ₹110 chocolate. X cannot be the one with ₹45, as he does not have enough money. X cannot be the one with ₹65, as he will have ₹10 remaining, which cannot be used for paying for another chocolate. X can be the one with ₹70, as he will have ₹15 remaining, which can be used for paying for ₹30 chocolate. X can be the one with ₹80, as he will have ₹25 remaining, which can be used for paying for ₹50 chocolate. X cannot be the one with ₹90, as he will have ₹35 remaining, which cannot be used for paying for any chocolate. Assume that the child with ₹80 paid for half of the ₹110 chocolate (along with the child who has ₹100). This child must have paid ₹25 for the other chocolate. The only children who could have paid ₹65 for the ₹130 chocolate are the ones with ₹65 and ₹90. The child with ₹90 would have paid ₹25 for a chocolate. However, in this case, the one with ₹65 cannot pay for any other chocolate. There are only two children left – the one with ₹45 and the one with ₹75. However, the chocolates that must be purchased are the ₹30 chocolate (by two children), ₹40 chocolate (by two children) and one half of the ₹90 chocolate. Since each child paid for not more than two chocolates, we cannot assign these values in this case. Hence, this case is not possible. Assume that the child with ₹70 paid for half of the ₹110 chocolate (along with the child who has ₹100). This child must have paid ₹15 for the other chocolate. Hence, he must have paid for the ₹30 chocolate. The other child who paid ₹15 for a chocolate cannot be the child with ₹45 (as there are no chocolates for which he could have paid the remaining ₹30), OR ₹65 (as there are no chocolates for which he could have paid the remaining ₹50) OR ₹90 (as there are no chocolates for which he could have paid the remaining ₹75). Hence, the other child who paid ₹15 for a chocolate must be the child with ₹80. This child must have paid ₹65 for the other chocolate. The other child who could have paid ₹65 for a chocolate can be the one with ₹65 OR the one with ₹90. If the one with ₹65 paid ₹65 for a chocolate, we cannot assign the remaining chocolates to the remaining children (i.e., the ones who have ₹45 and ₹90) ensuring that each child paid for not more than two chocolates (as there will be ₹40 chocolate, for two children, ₹50 chocolate, for two children, and one half of the ₹90 chocolate). Hence, the child with ₹90 must have paid for the ₹65 chocolate. The other chocolate that this child paid for must be the ₹50 chocolate, for which he would have paid ₹25. The other child who could have paid ₹25 for a chocolate cannot be the one with ₹65 as there are no chocolates for which he could have paid ₹40. Hence, the other child who could have paid ₹5 for a chocolate must be the one with ₹45. The other chocolate that this child must have paid for is the ₹40 chocolate, for which he would have paid ₹20. The child with ₹65 would have paid for the ₹90 chocolate (paying ₹45) and the ₹40 chocolate (paying ₹20).

The following table provides the amounts paid for the two chocolates by each child with different amounts of money:

Amount with Child	Paid for First Chocolate	Paid for Second Chocolate
45	20	25
65	45	20
70	55	15
80	65	15
90	25	65
100	55	45

From (i), the difference between the two chocolates is the highest for the child with ₹80. Hence, this must be Manish. Also, from (i), the difference is the lowest for the child with ₹45. This child must be Kishore. From (ii), the child with ₹70 and the child with ₹100 cannot be Ankur or Lokesh. Hence, Ankur and Lokesh must have ₹65 and ₹90, in any order. From (iii), Hem has at least ₹20 more than Ankur. Hence, Ankur must have ₹65 and Lokesh must have ₹90. Hem would have had ₹100, while Jai would have had ₹70.

The following table adds the names of the children to the above table:

Child	Amount with Child	Paid for First Chocolate	Paid for Second Chocolate
Kishore	45	20	25
Ankur	65	45	20
Jai	70	55	15
Manish	80	65	15
Lokesh	90	25	65
Hem	100	55	45

The amount with Jai before he paid for any chocolate is ₹70.

Ans: (70)

Q18. DIRECTIONS for questions 17 to 20: Type in your answer in the input box provided below the question.

What is the difference (in Rs.) between the amounts that Manish contributed for the two chocolates?

Given that the cost of the chocolates are ₹30, ₹40, ₹50, ₹90, ₹110 and ₹130. Also, each chocolate was paid for by exactly two children and the two children each paid half the price of chocolate. Hence, the prices that the children paid for the chocolates will be ₹15, ₹20, ₹25, ₹45, ₹55 and ₹65, each by two children.

One of the children has ₹100. Since no child paid for more than two chocolates and there are no chocolates for ₹100, this child must have paid for two chocolates. From the values above, the only possibility for this is if the child with ₹100 paid ₹55 for one chocolate and ₹45 for another chocolate.

Another child, say X, must have paid ₹55 for the ₹110 chocolate. X cannot be the one with ₹45, as he does not have enough money. X cannot be the one with ₹65, as he will have ₹10 remaining, which cannot be used for paying for another chocolate.

X can be the one with ₹70, as he will have ₹15 remaining, which can be used for paying for ₹30 chocolate.

X can be the one with ₹80, as he will have ₹25 remaining, which can be used for paying for ₹50 chocolate.

X cannot be the one with ₹90, as he will have ₹35 remaining, which cannot be used for paying for any chocolate.

Assume that the child with ₹80 paid for half of the ₹110 chocolate (along with the child who has ₹100). This child must have paid ₹25 for the other chocolate. The only children who could have paid ₹65 for the ₹130 chocolate are the ones with ₹65 and ₹90. The child with ₹90 would have paid ₹25 for a chocolate. However, in this case, the one with ₹65 cannot pay for any other chocolate.

There are only two children left – the one with ₹45 and the one with ₹75. However, the chocolates that must be purchased are the ₹30 chocolate (by two children), ₹40 chocolate (by two children) and one half of the ₹90 chocolate. Since each child paid for not more than two chocolates, we cannot assign these values in this case. Hence, this case is not possible.

Assume that the child with ₹70 paid for half of the ₹110 chocolate (along with the child who has ₹100). This child must have paid ₹15 for the other chocolate. Hence, he must have paid for the ₹30 chocolate.

The other child who paid ₹15 for a chocolate cannot be the child with ₹45 (as there are no chocolates for which he could have paid the remaining ₹30), OR ₹65 (as there are no chocolates for which he could have paid the remaining ₹50) OR ₹90 (as there are no chocolates for which he could have paid the remaining ₹75). Hence, the other child who paid ₹15 for a chocolate must be the child with ₹80. This child must have paid ₹65 for the other chocolate.

The other child who could have paid ₹65 for a chocolate can be the one with ₹65 OR the one with ₹90. If the one with ₹65 paid ₹65 for a chocolate, we cannot assign the remaining chocolates to the remaining children (i.e., the ones who have ₹45 and ₹90) ensuring that each child paid for not more than two chocolates (as there will be ₹40 chocolate, for two children, ₹50 chocolate, for two children, and one half of the ₹90 chocolate).

Hence, the child with ₹90 must have paid for the ₹65 chocolate. The other chocolate that this child paid for must be the ₹50 chocolate, for which he would have paid ₹25.

The other child who could have paid ₹25 for a chocolate cannot be the one with ₹65 as there are no chocolates for which he could have paid ₹40. Hence, the other child who could have paid ₹5 for a chocolate must be the one with ₹45. The other chocolate that this child must have paid for is the ₹40 chocolate, for which he would have paid ₹20.

The child with ₹65 would have paid for the ₹90 chocolate (paying ₹45) and the ₹40 chocolate (paying ₹20).

The following table provides the amounts paid for the two chocolates by each child with different amounts of money:

Amount with Child	Paid for First Chocolate	Paid for Second Chocolate
45	20	25
65	45	20
70	55	15
80	65	15
90	25	65
100	55	45

From (i), the difference between the two chocolates is the highest for the child with ₹80. Hence, this must be Manish. Also, from (i), the difference is the lowest for the child with ₹45. This child must be Kishore.

From (ii), the child with ₹70 and the child with ₹100 cannot be Ankur or Lokesh. Hence, Ankur and Lokesh must have ₹65 and ₹90, in any order.

From (iii), Hem has at least ₹20 more than Ankur. Hence, Ankur must have ₹65 and Lokesh must have ₹90. Hem would have had ₹100, while Jai would have had ₹70.

The following table adds the names of the children to the above table:

Child	Amount with Child	Paid for First Chocolate	Paid for Second Chocolate
Kishore	45	20	25
Ankur	65	45	20
Jai	70	55	15
Manish	80	65	15
Lokesh	90	25	65
Hem	100	55	45

The difference between the amounts that Manish paid for the two chocolates = $65 - 15 = 50$. Ans: (50)

Q19. DIRECTIONS for questions 17 to 20: Type in your answer in the input box provided below the question.

The six chocolates were purchased one after the other, with the order in which the chocolates were purchased being in the increasing order of their prices (i.e., the chocolate priced at Rs.30 was purchased before the chocolate priced at Rs.40 and so on).

After exactly four chocolates were purchased, what is the highest amount (in Rs.) remaining with any child?

Given that the cost of the chocolates are ₹30, ₹40, ₹50, ₹90, ₹110 and ₹130. Also, each chocolate was paid for by exactly two children and the two children each paid half the price of chocolate. Hence, the prices that the children paid for the chocolates will be ₹15, ₹20, ₹25, ₹45, ₹55 and ₹65, each by two children.

One of the children has ₹100. Since no child paid for more than two chocolates and there are no chocolates for ₹100, this child must have paid for two chocolates. From the values above, the only possibility for this is if the child with ₹100 paid ₹55 for one chocolate and ₹45 for another chocolate.

Another child, say X, must have paid ₹55 for the ₹110 chocolate. X cannot be the one with ₹45, as he does not have enough money. X cannot be the one with ₹65, as he will have ₹10 remaining, which cannot be used for paying for another chocolate.

X can be the one with ₹70, as he will have ₹15 remaining, which can be used for paying for ₹30 chocolate.

X can be the one with ₹80, as he will have ₹25 remaining, which can be used for paying for ₹50 chocolate.

X cannot be the one with ₹90, as he will have ₹35 remaining, which cannot be used for paying for any chocolate.

Assume that the child with ₹80 paid for half of the ₹110 chocolate (along with the child who has ₹100). This child must have paid ₹25 for the other chocolate. The only children who could have paid ₹65 for the ₹130 chocolate are the ones with ₹65 and ₹90. The child with ₹90 would have paid ₹25 for a chocolate. However, in this case, the one with ₹65 cannot pay for any other chocolate.

There are only two children left – the one with ₹45 and the one with ₹75. However, the chocolates that must be purchased are the ₹30 chocolate (by two children), ₹40 chocolate (by two children) and one half of the ₹90 chocolate. Since each child paid for not more than two chocolates, we cannot assign these values in this case. Hence, this case is not possible.

Assume that the child with ₹70 paid for half of the ₹110 chocolate (along with the child who has ₹100). This child must have paid ₹15 for the other chocolate. Hence, he must have paid for the ₹30 chocolate.

The other child who paid ₹15 for a chocolate cannot be the child with ₹45 (as there are no chocolates for which he could have paid the remaining ₹30), OR ₹65 (as there are no chocolates for which he could have paid the remaining ₹50) OR ₹90 (as there are no chocolates for which he could have paid the remaining ₹75). Hence, the other child who paid ₹15 for a chocolate must be the child with ₹80. This child must have paid ₹65 for the other chocolate.

The other child who could have paid ₹65 for a chocolate can be the one with ₹65 OR the one with ₹90. If the one with ₹65 paid ₹65 for a chocolate, we cannot assign the remaining chocolates to the remaining children (i.e., the ones who have ₹45 and ₹90) ensuring that each child paid for not more than two chocolates (as there will be ₹40 chocolate, for two children, ₹50 chocolate, for two children, and one half of the ₹90 chocolate).

Hence, the child with ₹90 must have paid for the ₹65 chocolate. The other chocolate that this child paid for must be the ₹50 chocolate, for which he would have paid ₹25.

The other child who could have paid ₹25 for a chocolate cannot be the one with ₹65 as there are no chocolates for which he could have paid ₹40. Hence, the other child who could have paid ₹5 for a chocolate must be the one with ₹45. The other chocolate that this child must have paid for is the ₹40 chocolate, for which he would have paid ₹20.

The child with ₹65 would have paid for the ₹90 chocolate (paying ₹45) and the ₹40 chocolate (paying ₹20).

The following table provides the amounts paid for the two chocolates by each child with different amounts of money:

Amount with Child	Paid for First Chocolate	Paid for Second Chocolate
45	20	25
65	45	20
70	55	15
80	65	15
90	25	65
100	55	45

From (i), the difference between the two chocolates is the highest for the child with ₹80. Hence, this must be Manish. Also, from (i), the difference is the lowest for the child with ₹45. This child must be Kishore.

From (ii), the child with ₹70 and the child with ₹100 cannot be Ankur or Lokesh. Hence, Ankur and Lokesh must have ₹65 and ₹90, in any order.

From (iii), Hem has at least ₹20 more than Ankur. Hence, Ankur must have ₹65 and Lokesh must have ₹90. Hem would have had ₹100, while Jai would have had ₹70.

The following table adds the names of the children to the above table:

Child	Amount with Child	Paid for First Chocolate	Paid for Second Chocolate
Kishore	45	20	25
Ankur	65	45	20
Jai	70	55	15
Manish	80	65	15
Lokesh	90	25	65
Hem	100	55	45

From the given information, the prices of the chocolates in the order that the chocolates were purchased are ₹30, ₹40, ₹50, ₹90, ₹110 and ₹130.

The first four chocolates to be purchased are the ₹30 chocolate, the ₹40 chocolate, ₹50 chocolate and the ₹90 chocolate.

The highest amount remaining with any person is ₹65 (with each of Manish and Lokesh).

Ans: (65)

Q20. DIRECTIONS for questions 17 to 20: Type in your answer in the input box provided below the question.

The six chocolates were purchased one after the other, with the order in which the chocolates were purchased being in the increasing order of their prices (i.e., the chocolate priced at Rs.30 was purchased before the chocolate priced at Rs.40 and so on).

Immediately after three chocolates were purchased, what is the total amount (in Rs.) remaining with all the six children?

Given that the cost of the chocolates are ₹30, ₹40, ₹50, ₹90, ₹110 and ₹130. Also, each chocolate was paid for by exactly two children and the two children each paid half the price of chocolate. Hence, the prices that the children paid for the chocolates will be ₹15, ₹20, ₹25, ₹45, ₹55 and ₹65, each by two children. One of the children has ₹100. Since no child paid for more than two chocolates and there are no chocolates for ₹100, this child must have paid for two chocolates. From the values above, the only possibility for this is if the child with ₹100 paid ₹55 for one chocolate and ₹45 for another chocolate. Another child, say X, must have paid ₹55 for the ₹110 chocolate. X cannot be the one with ₹45, as he does not have enough money. X cannot be the one with ₹65, as he will have ₹10 remaining, which cannot be used for paying for another chocolate. X can be the one with ₹70, as he will have ₹15 remaining, which can be used for paying for ₹30 chocolate. X can be the one with ₹80, as he will have ₹25 remaining, which can be used for paying for ₹50 chocolate. X cannot be the one with ₹90, as he will have ₹35 remaining, which cannot be used for paying for any chocolate. Assume that the child with ₹80 paid for half of the ₹110 chocolate (along with the child who has ₹100). This child must have paid ₹25 for the other chocolate. The only children who could have paid ₹65 for the ₹130 chocolate are the ones with ₹65 and ₹90. The child with ₹90 would have paid ₹25 for a chocolate. However, in this case, the one with ₹65 cannot pay for any other chocolate. There are only two children left – the one with ₹45 and the one with ₹75. However, the chocolates that must be purchased are the ₹30 chocolate (by two children), ₹40 chocolate (by two children) and one half of the ₹90 chocolate. Since each child paid for not more than two chocolates, we cannot assign these values in this case. Hence, this case is not possible. Assume that the child with ₹70 paid for half of the ₹110 chocolate (along with the child who has ₹100). This child must have paid ₹15 for the other chocolate. Hence, he must have paid for the ₹30 chocolate. The other child who paid ₹15 for a chocolate cannot be the child with ₹45 (as there are no chocolates for which he could have paid the remaining ₹30), OR ₹65 (as there are no chocolates for which he could have paid the remaining ₹50) OR ₹90 (as there are no chocolates for which he could have paid the remaining ₹75). Hence, the other child who paid ₹15 for a chocolate must be the child with ₹80. This child must have paid ₹65 for the other chocolate. The other child who could have paid ₹65 for a chocolate can be the one with ₹65 OR the one with ₹90. If the one with ₹65 paid ₹65 for a chocolate, we cannot assign the remaining chocolates to the remaining children (i.e., the ones who have ₹45 and ₹90) ensuring that each child paid for not more than two chocolates (as there will be ₹40 chocolate, for two children, ₹50 chocolate, for two children, and one half of the ₹90 chocolate). Hence, the child with ₹90 must have paid for the ₹65 chocolate. The other chocolate that this child paid for must be the ₹50 chocolate, for which he would have paid ₹25. The other child who could have paid ₹25 for a chocolate cannot be the one with ₹65 as there are no chocolates for which he could have paid ₹40. Hence, the other child who could have paid ₹5 for a chocolate must be the one with ₹45. The other chocolate that this child must have paid for is the ₹40 chocolate, for which he would have paid ₹20. The child with ₹65 would have paid for the ₹90 chocolate (paying ₹45) and the ₹40 chocolate (paying ₹20). The following table provides the amounts paid for the two chocolates by each child with different amounts of money:

Amount with Child	Paid for First Chocolate	Paid for Second Chocolate
45	20	25
65	45	20
70	55	15
80	65	15
90	25	65
100	55	45

From (i), the difference between the two chocolates is the highest for the child with ₹80. Hence, this must be Manish. Also, from (i), the difference is the lowest for the child with ₹45. This child must be Kishore.

From (ii), the child with ₹70 and the child with ₹100 cannot be Ankur or Lokesh. Hence, Ankur and Lokesh must have ₹65 and ₹90, in any order.

From (iii), Hem has at least ₹20 more than Ankur. Hence, Ankur must have ₹65 and Lokesh must have ₹90. Hem would have had ₹100, while Jai would have had ₹70.

The following table adds the names of the children to the above table:

Child	Amount with Child	Paid for First Chocolate	Paid for Second Chocolate
Kishore	45	20	25
Ankur	65	45	20
Jai	70	55	15
Manish	80	65	15
Lokesh	90	25	65
Hem	100	55	45

The third chocolate to be purchased is the ₹50 chocolate. The children would have paid for the ₹30 and ₹40 chocolates before this.

The total amount with all the children = $45 + 65 + 70 + 80 + 90 + 100 - 30 - 40 - 50 = 330$

Ans: (330)

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

In an examination there are five questions – Q1, Q2, Q3, Q4 and Q5 – each with five choices (a), (b), (c), (d) and (e). Five students – A, B, C, D and E – wrote the exam. The choices opted by the students for the questions Q1, Q2, Q3, Q4 and Q5 are shown in the table below. One mark is awarded for a right answer and no mark is awarded for a wrong answer. No two students got the same total marks in these five questions.

Name	Choice opted for				
	Q1	Q2	Q3	Q4	Q5
A	b	c	a	d	e
B	c	d	a	e	b
C	c	d	a	b	e
D	e	a	c	b	d
E	b	c	a	e	d

It is observed that no two questions have the same choice as the right answer.

Q21. DIRECTIONS for questions 21 and 22: Select the correct alternative from the given choices.
Who scored the least total marks?

- a) B
- b) A
- c) D ✓ Your answer is correct
- d) E

If a boy's answers for four questions are right, the fifth should also be right. This implies the scores of the boys are 5, 3, 2, 1 and zero in any order.

If A's answers are right, then A's score is 5.

B's score is 1

C's score is 2

D's score is 0

E's score is 3

If C's score is 5 then

A's score is 2

B's score is 3

D's score is 1

E's score is 1

\Rightarrow C's score is not 5.

This way we can deduce that the following are the two possibilities.

Score	Case I	Case II
5	B	A
3	C	E
2	E	C
1	A	B
0	D	D

D scored the least total marks.

Choice (C)

Q22. DIRECTIONS for questions 21 and 22: Select the correct alternative from the given choices.

What is correct answer choice for Q3?

- a) a ✓ Your answer is correct
- b) b
- c) c
- d) Cannot be determined

If a boy's answers for four questions are right, the fifth should also be right. This implies the scores of the boys are 5, 3, 2, 1 and zero in any order.

If A's answers are right, then A's score is 5.

B's score is 1

C's score is 2

D's score is 0

E's score is 3

If C's score is 5 then

A's score is 2

B's score is 3

D's score is 1

E's score is 1

⇒ C's score is not 5.

This way we can deduce that the following are the two possibilities.

Score	Case I	Case II
5	B	A
3	C	E
2	E	C
1	A	B
0	D	D

In both the cases, the correct answer choice for question 3 is a.

Choice (A)

Q23. DIRECTIONS for questions 23 and 24: Type in your answer in the input box provided below the question.

If A's score is more than E's score, then what is the score of B?

If a boy's answers for four questions are right, the fifth should also be right. This implies the scores of the boys are 5, 3, 2, 1 and zero in any order.

If A's answers are right, then A's score is 5.

B's score is 1

C's score is 2

D's score is 0

E's score is 3

If C's score is 5 then

A's score is 2

B's score is 3

D's score is 1

E's score is 1

\Rightarrow C's score is not 5.

This way we can deduce that the following are the two possibilities.

Score	Case I	Case II
5	B	A
3	C	E
2	E	C
1	A	B
0	D	D

In case II, A's score is more than E's. The score of B is 1.

Ans: (1)

Q24. DIRECTIONS for questions 23 and 24: Type in your answer in the input box provided below the question.

If C's score is less than B's score, then what is the score of E?

If a boy's answers for four questions are right, the fifth should also be right. This implies the scores of the boys are 5, 3, 2, 1 and zero in any order.

If A's answers are right, then A's score is 5.

B's score is 1

C's score is 2

D's score is 0

E's score is 3

If C's score is 5 then

A's score is 2

B's score is 3

D's score is 1

E's score is 1

⇒ C's score is not 5.

This way we can deduce that the following are the two possibilities.

Score	Case I	Case II
5	B	A
3	C	E
2	E	C
1	A	B
0	D	D

In case I, C's score is less than B's. The score of E is 2.

Ans: (2)

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

In a factory, which manufactures widgets, there are exactly six processes, P1 through P6, that each widget must pass through. Some of the six processes have constraints and all the constraints must be adhered to. The following table provides the time required for each process to be completed and the constraints that are present for each process:

Process	Time Required (in min)	Constraints
P1	28	Must start after P3 ends. Must start at most 5 minutes after P3 ends.
P2	32	Must start before P4 ends. Must start at most 15 minutes before P4 ends.
P3	19	Must end exactly 10 minutes before P2 ends.
P4	14	Must start exactly 20 minutes after P6 starts.
P5	27	Must end before P3 ends. Must end at most 25 minutes before P3 ends.
P6	33	Must start at least 15 minutes before P4 ends.

Assume that any process can begin only at the beginning of a minute and any process will end only at the beginning of a minute. For example, any process can begin at either 10:30:00 (in hh:mm:ss) or at 10:31:00 (in hh:mm:ss) but not at any other time in between and any process which starts at 10:30:00 (in hh:mm:ss) and takes 30 minutes to complete will end at 11:00:00 (in hh:mm:ss).

Q25. DIRECTIONS for questions 25 to 28: Select the correct alternative from the given choices. If a widget is manufactured in the minimum possible time, which of the following processes can be the third to end?

- a) P5
- b) P6
- c) P3
- d) P2

Let the time at which P5 starts be 0th minute. Since P5 takes 27 minutes to finish, P5 will end at 27th minute.

From the table, we can observe that P5 is linked to P3.

Given that P5 must end before P3 ends. Also P5 must end at most 25 minutes before P3 ends. To minimize the total time taken by P5 and P3, we can consider that P3 ends at 28th minute. In this case, P3 must start at 9th minute (since P3 requires 19 minutes to complete). P1 and P2 both depend on P3. P1 must start after P3 ends. To minimize the time, the earliest that P1 can start is at the 29th minute. Hence, P1 will end by the 57th minute.

P3 must end exactly 10 minutes before P2 ends. Hence, P2 must end at the 38th minute (since P3 ends at the 28th minute). P2 must start at the 6th minute.

P2 must start at most 15 minutes before P4 ends. The latest that P4 can end is at the 21st minute (since P2 starts at the 6th minute). The earliest that P4 can end is at the 14th minute, if P4 starts at the 0th minute (we need not take any earlier than 0th minute as the total time for all the processes will increase because of this).

P4 must start exactly 20 minutes after P6 starts. Hence, if P4 starts at the 0th minute, P6 must start at -20th minute. In this case, P6 will end at the 13th minute.

If P4 starts at 7th minute, P6 must start at -13th minute. In this case, P6 will end at the 20th minute.

In either case, the latest time which all the six processes will be complete is at the end of the 57th minute (for P1).

In either of the case, P6 starts at least 15 minutes before P4 ends. Hence, both these cases are valid.

To minimize the total time taken for all the processes, we need to find the latest time at which any process starts. P6 will be the earliest process and to minimize the total time, we can take P6 to start at -13th minute and end at 20th minute.

If we add 13 to all the starting times and ending times of all the processes, we get the following table on when each process should start:

Process	Start Time	End Time
P5	13	40
P3	22	41
P2	19	51
P1	42	70
P4	20	34
P6	0	33

Now, if we consider P5, the only constraint on P5 is that it must end before P3 ends and must end at most 25 minutes before P3 ends. Hence, P5 can end at any time between 16 and 40 minutes. P5 can start at any time between -11 and 13 minutes.

To minimize the time taken for manufacturing, P5 can start at any time between 0 and 13 minutes and can end at any time between 27 and 40 minutes. From the given options, P6, P3 and P2 cannot be the third process to end. Only P5 can be the third process to end.

Choice (A)

Q26. DIRECTIONS for questions 25 to 28: Select the correct alternative from the given choices.

If a widget is manufactured in the minimum possible time, and the first process to start commenced at 10:00 AM, at what time will P2 start?

a) 10:20 AM

b) 10:19 AM

c) **10:42 AM**

d) **10:17 AM**

From the given table, we can see that P1 and P5 depend on P3, P3 depends on P2, P2 depends on P4, P4 depends on P6 and P6 depends on P4. We can start with either P1 or P5 and find the minimum and maximum time at which each process can be finished.

From the above solution, if the first process, P6, started at 10:00 AM, P2 will start at
10:19 AM. Choice (B)

Q27. DIRECTIONS for questions 25 to 28: Select the correct alternative from the given choices.
What is the maximum time (in minutes) required for manufacturing each widget?

a) **84**

b) 90

c) **92**

d) **88**

From the given table, we can see that P1 and P5 depend on P3, P3 depends on P2, P2 depends on P4, P4 depends on P6 and P6 depends on P4. We can start with either P1 or P5 and find the minimum and maximum time at which each process can be finished.

We can start with P6 for finding the maximum time required.

P6 can start at 0th minute. It will end at the 33rd minute.

P4 has to start exactly 20 minutes after P6 starts. Hence, P4 must start at 20th minute and end at 34th minute.

P2 must start before P4 ends. P2 can start at 33rd minute and end at 65th minute (if we decrease the starting time, the ending time will also decrease and so, will the overall time taken for these three processes).

P3 has to end exactly 10 minutes before P2 ends. Hence, P3 must end at 55th minute and must start at 36th minute.

P1 must start at most 5 minutes after P3 ends. The latest time at which P1 can start is 60th minute. Hence, P1 can end at the 88th minute.

P5 must end at most 25 minutes before P3 ends. It must end at any time between 30th minute and 54th minute (since P3 ends at 55th minute). Hence, P5 must start at 3rd minute or 27th minute.

This information is tabulated below:

Process	Start Time	End Time
P6	0	33
P4	20	34
P2	33	65
P3	36	55
P1	60	88
P5	3-27	30-54

Hence, the maximum time taken for manufacturing a widget is 88 minutes.

Choice (D)

Q28. DIRECTIONS for questions 25 to 28: Select the correct alternative from the given choices.
If a widget is manufactured in the maximum possible time, what is the fifth process to start?

- a) P5
- b) P2
- c) P3
- d) P1

From the given table, we can see that P1 and P5 depend on P3, P3 depends on P2, P2 depends on P4, P4 depends on P6 and P6 depends on P4. We can start with either P1 or P5 and find the minimum and maximum time at which each process can be finished.

From the above solution, the first process to start is P6. The second and third processes can be P5 and P4, in any order. The fourth process will be P2 and the fifth process is P3.

Choice (C)

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

Seven persons – A through G – each a different professional among lawyer, doctor, professor accountant, scientist, engineer and consultant, live in a building, with each person occupying a different floor, from the first floor to the seventh floor. The following information is known about them:

- i. The accountant lives on a floor above the fourth floor, on which the engineer lives and B is not the accountant.
- ii. The lawyer does not live on a floor above the floor on which the doctor lives.
- iii. A, the professor, lives on a floor immediately above the floor on which the lawyer lives and C is not the doctor.
- iv. F, the scientist, lives on a floor above the floor on which B, who is neither the consultant nor the doctor, lives.
- v. G lives exactly two floors below E and the scientist lives exactly three floors above the lawyer.

Q29. DIRECTIONS *for questions 29 to 32*: Select the correct alternative from the given choices. Which of the following statements is definitely true?

- a) **E lives on the seventh floor.**
- b) E is the accountant.
- c) **C is the accountant.**
- d) **The consultant lives on the first floor.**

From the given conditions the professions of the following persons are A – professor F – scientist.

B cannot be consultant, doctor or accountant \Rightarrow B should be either lawyer or engineer

From condition (i) the engineer lives on the fourth floor and the accountant lives on either the 5th, the 6th or the 7th floor.

From conditions (ii) and (iii) the doctor and the professor are above the lawyer \Rightarrow the lawyer must live a floor below the 4th floor. As the engineer lives on the fourth floor and the lawyer is not on the first floor, the lawyer must be on the second floor and A, the professor, must be on the third floor

From condition (v) F, the scientist, must live on the fifth floor. As the doctor lives above the lawyer, and the accountant above the engineer, the doctor and the accountant must occupy the sixth and seventh floors in any order.

\Rightarrow The consultant must live on the first floor. As G lives two floors below E, from the above results, E must be on 6th floor and G on 4th floor

\Rightarrow G is the Engineer and B is the Lawyer.

The results can be tabulated as follows

Floor	Person	Profession
7	D/C	Accountant/Doctor
6	E	Doctor/Accountant
5	F	Scientist
4	G	Engineer
3	A	Professor
2	B	Lawyer
1	C/D	Consultant

From the table we can see that the statement. "The consultant lives on the first floor", is definitely true
Choice (D)

Q30. DIRECTIONS for questions 29 to 32: Select the correct alternative from the given choices.
Which of the following two statements, if true, will be sufficient to uniquely determine the professions of all the seven people?

I. E is the doctor

II. D is the consultant

a) I alone

b) II alone

c) Both I and II together

d) Both the statements together are also not sufficient

From the given conditions the professions of the following persons are A – professor F – scientist.

B cannot be consultant, doctor or accountant \Rightarrow B should be either lawyer or engineer
From condition (i) the engineer lives on the fourth floor and the accountant lives on either the 5th, the 6th or the 7th floor.

From conditions (ii) and (iii) the doctor and the professor are above the lawyer \Rightarrow the lawyer must live a floor below the 4th floor. As the engineer lives on the fourth floor and the lawyer is not on the first floor, the lawyer must be on the second floor and A, the professor, must be on the third floor

From condition (v) F, the scientist, must live on the fifth floor. As the doctor lives above the lawyer, and the accountant above the engineer, the doctor and the accountant must occupy the sixth and seventh floors in any order.

\Rightarrow The consultant must live on the first floor. As G lives two floors below E, from the above results, E must be on 6th floor and G on 4th floor

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The results can be tabulated as follows

Floor	Person	Profession
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5	F	Scientist
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3	A	Professor
2	B	Lawyer
1	C/D	Consultant

From statement (i) we can't determine whether D or C is the accountant. However, from statement (ii), if D is the consultant, then C must be the accountant and E must be the doctor. Hence statement (ii) alone is sufficient to determine the professions of all the persons.
Choice (B)

Q31. Who among the following is the Engineer?

a) B

b) D

c) E

d) G

From the given conditions the professions of the following persons are A – professor F – scientist.

B cannot be consultant, doctor or accountant \Rightarrow B should be either lawyer or engineer

From condition (i) the engineer lives on the fourth floor and the accountant lives on either the 5th, the 6th or the 7th floor.

From conditions (ii) and (iii) the doctor and the professor are above the lawyer \Rightarrow the lawyer must live a floor below the 4th floor. As the engineer lives on the fourth floor and the lawyer is not on the first floor, the lawyer must be on the second floor and A, the professor, must be on the third floor

From condition (v) F, the scientist, must live on the fifth floor. As the doctor lives above the lawyer, and the accountant above the engineer, the doctor and the accountant must occupy the sixth and seventh floors in any order.

\Rightarrow The consultant must live on the first floor. As G lives two floors below E, from the above results, E must be on 6th floor and G on 4th floor

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The results can be tabulated as follows

Floor	Person	Profession
7	D/C	Accountant/Doctor
6	E	Doctor/Accountant
5	F	Scientist
4	G	Engineer
3	A	Professor
2	B	Lawyer
1	C/D	Consultant

From the table, G is the Engineer.

Choice (D)

Q32. What is the profession of the person who lives on the floor immediately above the floor on which G lives?

- a) Scientist
- b) Engineer
- c) Consultant
- d) Doctor

From the given conditions the professions of the following persons are A – professor F – scientist.

B cannot be consultant, doctor or accountant \Rightarrow B should be either lawyer or engineer

From condition (i) the engineer lives on the fourth floor and the accountant lives on either the 5th, the 6th or the 7th floor.

From conditions (ii) and (iii) the doctor and the professor are above the lawyer \Rightarrow the lawyer must live a floor below the 4th floor. As the engineer lives on the fourth floor and the lawyer is not on the first floor, the lawyer must be on the second floor and A, the professor, must be on the third floor

From condition (v) F, the scientist, must live on the fifth floor. As the doctor lives above the lawyer, and the accountant above the engineer, the doctor and the accountant must occupy the sixth and seventh floors in any order.

\Rightarrow The consultant must live on the first floor. As G lives two floors below E, from the above results, E must be on 6th floor and G on 4th floor

\Rightarrow G is the Engineer and B is the Lawyer.

The results can be tabulated as follows

Floor	Person	Profession
7	D/C	Accountant/Doctor
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3	A	Professor
2	B	Lawyer
1	C/D	Consultant

F, who lives above G, is a scientist.

Choice (A)

Q1. DIRECTIONS for questions 1 and 2: Select the correct alternative from the given choices.

If α_1 and α_2 are the real roots of $x^2 - px + 12 = 0$, then which of the following statements is definitely true?

a) $|\alpha_1 + \alpha_2| \leq 2\sqrt{3}$

b) $|\alpha_1 - \alpha_2| \leq 2\sqrt{3}$

c) $|\alpha_1 + \alpha_2| \geq 4\sqrt{3}$

d) $|\alpha_1 - \alpha_2| \geq 4\sqrt{3}$

If the roots are real, then discriminant ≥ 0

$$\Rightarrow p^2 - 4 \times 12 \geq 0 \Rightarrow p^2 \geq 48 \Rightarrow |p| \geq \sqrt{48}$$

$$\Rightarrow |p| \geq 4\sqrt{3}$$

But p is the sum of the roots α_1 & α_2

$$\Rightarrow |\alpha_1 + \alpha_2| \geq 4\sqrt{3}$$

Choice (C)

Q2. DIRECTIONS for questions 1 and 2: Select the correct alternative from the given choices.

Find the equation of the line parallel to the line $2x + 3y = 6$ and having a y intercept of 5.

a) $2x + 3y = 13$

b) $2x + 3y = 10$

c) $2x + 3y = 15$

d) $2x + 3y = 5$

The line parallel to $2x + 3y = 6$, will be of the form $2x + 3y = k$.
Since, the y-intercept of $2x + 3y = k$ is given as 5, the point $(0, 5)$ lies on $2x + 3y = k$.
Hence, $2(0) + 3(5) = k$, i.e., $k = 15$
 \therefore required equation is $2x + 3y = 15$

Choice (C)

Q3. DIRECTIONS for questions 3 to 6: Type in your answer in the input box provided below the question.

In how many ways can an amount of Rs.100 be paid using exactly 27 coins of denominations Rs.1, Rs.2 and Rs.5, such that at least one coin of each denomination is used?

Let the number of one rupee and two rupee coins used be denoted by x and y respectively. Therefore the number of five rupee coins

Now will be $27 - x - y$

$$x + 2y + 5(27 - x - y) = 100$$

$$\Rightarrow 4x + 3y = 35 \quad \text{_____ (1)}$$

This equation has only three solutions (since $x, y \geq 1$), i.e., $(2, 9)$, $(5, 5)$ and $(8, 1)$.

Therefore one can pay ₹100 using coins in the given denominations in exactly three ways

Ans: (3)

Q4. DIRECTIONS for questions 3 to 6: Type in your answer in the input box provided below the question.

If $25^{\{\log_5 12 + 3 \log_x 16\}} = \frac{9}{256}$, find the value of x .

Since we can observe that the only logarithm in the given equation is to the base 5, let us take $x = 5^a$

$$\Rightarrow \log_5 12 + 3\log_x 16 = \log_5 12 + 3\log_{5^a} 16$$

$$= \log_5 12 + \frac{3}{a} \log_5 16$$

$$= \log_5 12 + \log_5 16^{\frac{3}{a}}$$

$$= \log_5 [(12) \times (16^{\frac{3}{a}})]$$

$$\Rightarrow 25^{\{\log_5 12 + 3\log_x 16\}} = 5^{2\log_5(12)(16)^{\frac{3}{a}}}$$

$$= 5^{\log_5[(12)(16)^{\frac{3}{a}}]^2}$$

$$= \left[(12)(16)^{\frac{3}{a}} \right]^2$$

$$\Rightarrow \left[(12)(16)^{\frac{3}{a}} \right]^2 = \frac{9}{256}$$

$$\Rightarrow (12)(16)^{\frac{3}{a}} = \pm \frac{3}{16}$$

But $(12)(16)^{\frac{3}{a}}$ cannot be negative.

$$\Rightarrow (12) \left(16^{\frac{3}{a}} \right) = \frac{3}{16}$$

$$\Rightarrow 16^{\frac{3}{a}} = \frac{1}{64}$$

$$\Rightarrow 2^{\frac{-12}{a}} = 2^{-6}$$

$$\Rightarrow a = -2$$

\therefore The value of $x = 5^{-2} = 0.04$

Alternative Solution 1:

The given equation can be written as

$$(5^2)^{\{\log_5 12 + 3\log_x 16\}} = \frac{9}{256}$$

$$\Rightarrow 2\log_5 12 + 6\log_5 16 = \log_5 9 - 2\log_5 16 \quad (\text{taking log to base 5 on both sides})$$

$$\Rightarrow 6\log_5(2^4) = \log_5(3^2) - 2\log_5(2^4) - 2\log_5(2 \times 3)$$

$$\Rightarrow 24\log_5 2 = \log_5 \left(\frac{3^2}{2^8 \cdot 2^4 \cdot 3^2} \right)$$

$$\Rightarrow 24\log_5 2 = \log_5(2^{-12})$$

$$\Rightarrow 2\log_5 2 = -\log_5 2$$

$$\Rightarrow \frac{2\log 2}{\log x} = \frac{-\log 2}{\log 5}$$

$$\Rightarrow \log x = \log_5 2$$

$$\Rightarrow x = 5^{-2}$$

Ans: (0.04)

Q5. DIRECTIONS for questions 3 to 6: Type in your answer in the input box provided below the question.

What is the remainder when the number 382382 upto 300 digits is divided by 101?

Let $N = 382\ 382 \dots$ upto 300 digits

$$\Rightarrow N = 38 \times 10^{298} + 23 \times 10^{296} + 82 \times 10^{294} + 38 \times 10^{292} + \dots + 82 \times 10^0$$

$$\Rightarrow N = 38 \times (10^2)^{149} + 23 \times (10^2)^{148} + 82 \times (10^2)^{147} + 38 \times (10^2)^{146} + \dots + 82 \times 10^0$$

$$\Rightarrow \text{Rem} \left[\frac{N}{101} \right] = 38 \times (-1)^{149} + 23 \times (-1)^{148} + \dots + 82$$

$$\Rightarrow \text{Rem} \left[\frac{N}{101} \right] = 25(-38 + 23 - 82 + 38 - 23 + 82)$$

$$\Rightarrow \text{Rem} \left[\frac{N}{101} \right] = 0$$

Ans: (0)

Q6. DIRECTIONS for questions 3 to 6: Type in your answer in the input box provided below the question.

A milkman purchased milk at a certain price, diluted it by adding water and then sold the mixture at $33\frac{1}{3}\%$ above his cost price and thereby made a profit of 40%. Find the quantity (in ml) of water he added for every litre of milk purchased.

Let the cost price per ml of milk be ₹1

CP of 1000ml = ₹1000

Let the quantity of water added to each 1000 ml of milk be U ml.

Now he sells $(1000 + U)$ at ₹ $\frac{4}{3}$ per ml to get ₹1400

$$(1000 + U) \frac{4}{3} = 1400$$

$$\Rightarrow 4000 + 4U = 4200$$

$$\Rightarrow U = 50$$

Ans: (50)

Q7. DIRECTIONS for questions 7 to 10: Select the correct alternative from the given choices.

How many scalene triangles of perimeter 20 cm exist, such that the lengths (in cm) of all the three sides are integers?

a) 4

b) 7

c) 8

d) None of the above

Let p , q and r be the sides of each triangle satisfying the given conditions. It is required that the triangles be scalene.

\therefore let $p < q < r$

Now, $p + q + r = 20$, where p , q and r are integers.

As per the triangle inequality, the sum of any two sides of a triangle must be greater than the third side.

\therefore The longest side of a scalene triangle must be more than one-third of the perimeter but less than half of the perimeter of the triangle.

$$\Rightarrow \frac{20}{3} < r < 10$$

$\therefore r$ could be 7, 8 or 9

If r is 7, $p + q = 13$ and there is no possible set of (p, q) such that $p < q < r$

If r is 8, $p + q = 12$

$\therefore (p, q) = (5, 7)$

If r is 9, $p + q = 11$

$\therefore (p, q) = (5, 6), (4, 7)$ or $(3, 8)$

$\therefore (p, q, r)$ has a total of four possible values.

Choice (A)

Q8. DIRECTIONS for questions 7 to 10: Select the correct alternative from the given choices.

Find the sum of the first 15 terms of the series $1 \times 3 + 2 \times 4 + 3 \times 5 + 4 \times 6 + \dots$.

a) 1480

b) 1360

c) 1240

d) 1560

$$\begin{aligned}
 t_n &= n(n+2) = n^2 + 2n \\
 S_n &= \sum n^2 + \sum 2n \\
 &= \frac{n(n+1)(2n+1)}{6} + 2 \left(\frac{n(n+1)}{2} \right) \\
 S_{15} &= \frac{15 \times 16 \times 31}{6} + 15 \times 16 \\
 &= 15 \times 16 \left(\frac{37}{6} \right) = 5 \times 8 \times 37 = 1480
 \end{aligned}$$

Alternative Solution:

Since the sum required is only upto 15 terms and the series is very simple, we could directly (and carefully) put down all 15 terms and calculate the required sum as
 $3 + 8 + 15 + 24 + \dots + 255 = 1480$. Choice (A)

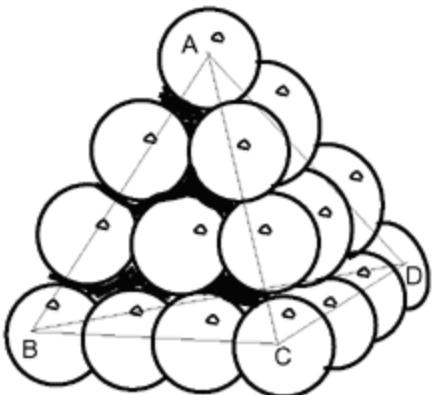
Q9. DIRECTIONS for questions 7 to 10: Select the correct alternative from the given choices.
Twenty identical billiard balls (spherical) are perfectly arranged on a table in four layers, with the bottom most through the top most layers comprising 10, 6, 3 and 1 balls respectively, such that the resulting shape resembles a regular tetrahedron. If the radius of each ball is R, what is the height of the top most point of the formation from the surface of the table?

a) $2(2 + \sqrt{3})R$

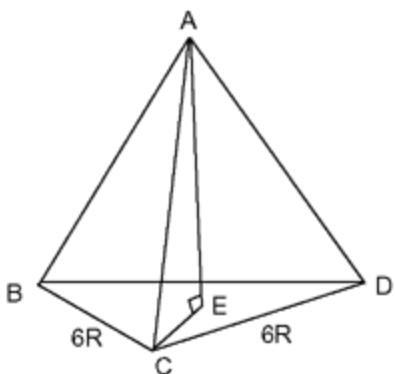
b) $2(1 + \sqrt{3})R$

c) $2(1 + \sqrt{6})R$

d) $2(1 + 2\sqrt{3})R$



By joining the centres of the four corner most spheres, we get the following figure.



ACE is a right angled triangle, where E is the centroid of $\triangle BCD$.

$\triangle BCD$ is an equilateral triangle with the side equal to $6R$, where R is the radius of each sphere.

$$\Rightarrow CE = \text{circumradius of the triangle } BCD = \frac{6R}{\sqrt{3}} = 2\sqrt{3} R$$

$$AE^2 + EC^2 = AC^2$$

$$AE^2 + (2\sqrt{3}R)^2 = (6R)^2$$

$$\therefore AE^2 = 36R^2 - 12R^2 = 24R^2$$

$$\therefore AE = 2\sqrt{6} R$$

\therefore The height of the tetrahedron = The distance of the topmost point from the surface

$$= R + AE + R = R + 2\sqrt{6}R + R = 2(1 + \sqrt{6})R$$

Choice (C)

Q10. DIRECTIONS for questions 7 to 10: Select the correct alternative from the given choices.

P starts from city A towards city B. After some time, Q and R start from cities A and B respectively at 5 kmph and 12 kmph, towards B and A respectively. The distance between A and B is 100 km. If P and Q meet at 20 km from A, and P and R meet at 28 km from A, what is the speed of P?

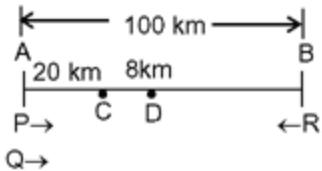
- a) 3 kmph

b) 4 kmph

c) 2.5 kmph

d) 2 kmph

Let P and Q meet at C and P and R meet at D.



To travel 20 km, time taken by Q = $\frac{20}{5} = 4$ hrs

Let P started 'h' hours before Q and R

$$\Rightarrow \text{Speed of P} = \frac{20}{4+h} \rightarrow (1)$$

To travel $100 - 28 = 72$ km, time taken by R = $\frac{72}{12} = 6$ hours

$$\Rightarrow \text{Speed of P} = \frac{28}{6+h} \rightarrow (2)$$

(1) = (2)

$$\Rightarrow \frac{20}{4+h} = \frac{28}{6+h} \Rightarrow h = 1 \text{ hour}$$

$$\text{Speed of P} = \frac{20}{5} = 4 \text{ kmph}$$

Alternative Solution:

Let Q overtake P at C, where AC = 20 km

Now, Q took $\frac{20}{5} = 4$ hours to catch up with P.

In these 4 hours R travelled from B to D, where BD = $12 \times 4 = 48$ km.

Hence, CD = AB - (AC + BD)

$$= 100 - (20 + 48) = 32 \text{ km}$$

Now, P and R are moving from points C and D, at speeds of p kmph (say) and 12 kmph and meet at, say E where AE = 28 km, or CE = 8 km.

$$\therefore \frac{p}{p+12} = \frac{8}{32} \Rightarrow p = 4 \text{ kmph}$$

Choice (B)

Q11. DIRECTIONS for question 11: Type in your answer in the input box provided below the question.

The vertical distance covered by a body falling freely under gravity is directly proportional to the square of the time for which it falls. If a body covers 300 m in the first 10 seconds of its free fall, what is the distance (in m) covered by the body in the next 10 seconds of its fall?

It is given that,

The distance covered, (d) $\propto t^2$.

$$\therefore d = kt^2.$$

$$\text{Distance covered in first 10 seconds} = k (10)^2 = 300$$

$$\Rightarrow k = 3.$$

$$\text{Distance covered in the first 20 seconds} = k (20)^2 = 1200$$

Therefore, the body covers $1200 - 300 = 900$ m in the next 10 seconds.

Ans: (900)

Q12. DIRECTIONS for questions 12 to 14: Select the correct alternative from the given choices.
If the simple interest and the compound interest on a certain sum of money, for two years, at the same rate of interest, are Rs.720 and Rs.792 respectively, find the rate of interest.

- a) 5%
- b) 10%
- c) 20% ✓ Your answer is correct
- d) 36%

Difference in compound interest and simple interest for two years = Interest on the simple interest for the first year.

$$\text{S.I for 2 years} = 2 \times \text{S.I for 1 year} = 720$$

$$\Rightarrow (\text{S.I}) \text{ for 1 year} = 360$$

$$\Rightarrow 792 - 720 = \frac{360 \times 1 \times R}{100}$$

$$\Rightarrow 72 = \frac{360 \times R}{100}$$

$$\Rightarrow R = 20\%$$

\therefore Rate of Interest = 20% per annum

Choice (C)

Q13. DIRECTIONS for questions 12 to 14: Select the correct alternative from the given choices.

The total cost of 2 pencils, 5 erasers and 7 sharpeners is Rs.30, while 3 pencils and 5 sharpeners cost Rs.15 more than 6 erasers. By what amount (in Rs.) does the cost of 39 erasers and 1 sharpener exceed the cost of 6 pencils?

- a) 20
- b) 30
- c) 27
- d) Cannot be determined

Let the cost of a pencil, eraser and sharpener (in rupees) be p , e , s respectively.

$$2p + 5e + 7s = 30 \quad (1)$$

$$3p - 6e + 5s = 15 \quad (2)$$

We need the value of the following expression

$$E = -6p + 39e + s$$

We assume that by multiplying equation (1) by x and equation (2) by y and adding we get the equation E . By considering the coefficients of only p and e , we get $2x + 3y = -6$ and $5x - 6y = 39$

$$\text{This gives } x = \frac{(6)(-6) - 3(39)}{(2)(-6) - (5)(3)} = \frac{36 - 117}{-12 - 15} = \frac{-81}{-27} = 3 \text{ and } \therefore y = -4$$

[Note: Observe that the coefficients of s also combine in the same way to match the coefficient of s in E i.e., $3(7) - 4(5) = 1$].

$$\therefore E = 3(30) - 4(15) = 30$$

Choice (B)

Q14. DIRECTIONS for questions 12 to 14: Select the correct alternative from the given choices.

A certain number of bacterial cells are placed in a petri dish and every hour exactly k % of the bacteria that are present at the beginning of the hour perish. If it was noted that the number of bacteria that perished in the first two hours is the same as the number of all the bacteria that perished after the first two hours, approximately what percentage of the initial bacteria were alive after the third hour?

- a) 26.24%
- b) 29.37%

c) 42.10%

d) 35.36%

Since the number of bacteria that perished in the first two hours is same as that which perished after that, it follows that exactly half of the initial bacteria perished in the first two hours.

Assuming N bacteria were present at the beginning,

Number of bacteria perishing in 1st hour = KN

Number of bacteria perishing in 2nd hour = K(1 – K)N

$$\therefore KN + K(1 - K)N = \frac{N}{2}$$

$$\Rightarrow 4K + K^2 - 1 = 0$$

$$\Rightarrow K = 1 \pm \frac{1}{\sqrt{2}}$$

However, K cannot be greater than 1. Hence, $K = 1 - \frac{1}{\sqrt{2}}$

Now, $\frac{N}{2}$ bacteria were present at the beginning of the third hour (i.e., after the first two hours)

Hence, the percentage that will remain after the 3rd hour

$$= \frac{N}{2} \left(1 - \left(1 - \frac{1}{\sqrt{2}} \right) \right) = \frac{N}{2\sqrt{2}} \approx 35.4\% \text{ of } N.$$

Alternative Solution:

Let the fraction of bacteria that survive at the end of every hour be 's'. It is given that

50% of bacteria survived (i.e., $\frac{1}{2}$) after 2 hours.

Therefore $s^2 = \frac{1}{2}$, i.e. $s = \frac{1}{\sqrt{2}}$. Now, at the end of the third hour, the fraction that will survive

$$= \frac{1}{2} \times s = \frac{1}{2} \times \frac{1}{\sqrt{2}} = 35.36\%$$

Choice (D)

Q15. DIRECTIONS for question 15: Type in your answer in the input box provided below the question.

Find the number of distinct terms in the expansion of $(x + y + z + w)^{10}$.

The sum of the indices of any term in the expansion will be equal to 10.

Let a, b, c and d be the indices of x, y, z and w respectively in a term.

∴ The number of terms in the expansion of $(x + y + z + w)^{10}$

= The number of solutions of the equation $a + b + c + d = 10$.

Since any of a, b, c and d can be zero, the number of solutions of

$$a + b + c + d = 10 \text{ is } {}^{(10+4-1)}C_{(4-1)} = {}^{13}C_3 = \frac{13 \times 12 \times 11}{3 \times 2 \times 1} = 286. \quad \text{Ans: (286)}$$

Q16. DIRECTIONS for questions 16 to 20: Select the correct alternative from the given choices.

x is an integer such that $16 \leq x \leq 81$. If $-y = \frac{x^2 + 3\sqrt{x}(2x + 9) + 162}{x + 9\sqrt{x} + 18}$, then what is the range of y ?

a) $-63 \leq y \leq -13$

b) $39 \leq y \leq 52$

c) $13 \leq y \leq 63$

d) $-28 \leq y \leq 75$

$$\text{Given, } -y = \frac{x^2 + 3\sqrt{x}(2x + 9) + 162}{x + 9\sqrt{x} + 18}$$

$$= \frac{(x^{3/2} + 27)(\sqrt{x} + 6)}{(\sqrt{x} + 3)(\sqrt{x} + 6)} = x - 3\sqrt{x} + 9 \text{ for } 16 \leq x \leq 81$$

$$\Rightarrow 13 \leq -y \leq 63;$$

$$\Rightarrow -63 \leq y \leq -13$$

Choice (A)

Q17. DIRECTIONS for questions 16 to 20: Select the correct alternative from the given choices.

Let $X = (6p + 12q - 18r)^3 + (12p - 18q + 6r)^3 + (-18p + 6q + 12r)^3 - 3(6p + 12q - 18r)(12p - 18q + 6r)(-18p + 6q + 12r)$, where each of p, q and r is greater than 1000.

Consider the following statements:

I. X must be non-negative.

II. X must be non-positive.

Which of the following can be concluded?

- a) Only I is true.
- b) Only II is true.
- c) Both I and II are true.
- d) Neither I nor II is true.

Let $a = 6p + 12q - 18r$, $b = 12p - 18q + 6r$, $c = -18p + 6q + 12r$.

Here, $a + b + c = 0$.

$\therefore X = a^3 + b^3 + c^3 - 3abc = 0$

Both I and II are true.

Choice (C)

Q18. DIRECTIONS for questions 16 to 20: Select the correct alternative from the given choices.

The length of a direct common tangent of two circles, whose radii are in the ratio 1 : 2, is $6\sqrt{5}$ cm. If the length of the transverse common tangent of the two circles is $2\sqrt{13}$ cm, what is the distance between their centres?

- a) 6 cm
- b) 8 cm
- c) 12 cm
- d) 14 cm

Let the radii of the circles be r and $2r$ and the distance between their centres be d .

$$\text{Given, } \sqrt{d^2 - r^2} = 6\sqrt{5} \Rightarrow d^2 - r^2 = 180$$

$$\text{Also, } \sqrt{d^2 - 9r^2} = 2\sqrt{13} \Rightarrow d^2 - 9r^2 = 52$$

Solving the two equations, we get, $d^2 = 196 \Rightarrow d = 14 \text{ cm}$

Choice (D)

Q19. DIRECTIONS for questions 16 to 20: Select the correct alternative from the given choices.

If x and y are positive integers, find the value of $3x - 2y$, given $x^2 y^3 = 256$ and $x > y$.

- a) 46
- b) 48
- c) 50
- d) Cannot be determined

Given expression is

$$x^2 y^3 = 256 \Rightarrow x^2 y^3 = (16)^2 (1)^3 \text{ or } (2^2) (4^3)$$

As x and y are positive and $x > y$, $x = 16$ and $y = 1$.

$$\therefore 3x - 2y = 3(16) - 2 = 46$$

Choice (A)

Q20. DIRECTIONS for questions 16 to 20: Select the correct alternative from the given choices.

$$(22)_3 + (22)_4 + (22)_5 + \dots + (22)_n =$$

- a) $3n^2 - 6n - 1$
- b) $2n^2 - 3n - 1$
- c) $n^2 + 3n - 10$ ✓ Your answer is correct
- d) $n^3 - 3n^2 + 3n + 2$

$$\begin{aligned}
 & (22)_3 + (22)_4 + (22)_5 + \dots + (22)_n = \\
 &= (2(3) + 2) + (2(4) + 2) + (2(5) + 2) + \dots + (2(n) + 2) \\
 &= 2(3 + 4 + \dots + n) + 2(n - 2) \\
 &= 2(1 + 2 + 3 + 4 + \dots + n - (1 + 2)) + 2(n - 2) \\
 &= 2\left(\frac{(n)(n+1)}{2} - 3\right) + 2n - 4 \\
 &= n^2 + n - 6 + 2n - 4 \\
 &= n^2 + 3n - 10
 \end{aligned}$$

Alternative Solution:

Considering only the first term, i.e., $(22)_3$, $n = 3$ and $(22)_3 = 3 \times 2 + 2 = 8$.

Substituting $n = 3$ in each option, option (D) is eliminated.

Now, considering $n = 4$, $(22)_3 + (22)_4 = (2 \times 3 + 2) + (2 \times 4 + 2) = 18$.

Substituting $n = 4$ in each option, options (A) and (B) are eliminated as they become odd (no need to calculate).

Among options (C) and (D), only option (C) satisfies.

Choice (C)

Q21. DIRECTIONS for question 21: Type in your answer in the input box provided below the question.

If the lines $2x + 3y - 5 = 0$, $2x + 3y - 10 = 0$, $3x + 2y - 5 = 0$ and $3x + 2y - 10 = 0$ represent the sides of a parallelogram, then find the area (in sq.units) of the parallelogram.

The area of a parallelogram is bh , where b is the length of the base and h is the height of the parallelogram.

We can consider any one side as the base of the parallelogram and we can find the corresponding height (the distance between parallel sides).

Let us consider, $2x + 3y - 5 = 0$ as the base.

Then, the vertices of the base are the intersection points of

$(2x + 3y - 5 = 0, 3x + 2y - 5 = 0)$ and

$(2x + 3y - 5 = 0, 3x + 2y - 10 = 0)$, i.e., $(1, 1), (4, -1)$.

$$\therefore \text{The length of the base (b)} = \sqrt{(1-4)^2 + (1-(-1))^2} = \sqrt{3^2 + 2^2} = \sqrt{13} \text{ units.}$$

The height of the parallelogram is the distance between

$$2x + 3y - 5 = 0 \text{ and } 2x + 3y - 10 = 0 \Rightarrow \frac{|c_1 - c_2|}{\sqrt{a^2 + b^2}} = \frac{|-5 - (-10)|}{\sqrt{2^2 + 3^2}} = \frac{|5|}{\sqrt{13}} \text{ units}$$

$$\therefore \text{The area of the parallelogram} = bh = \sqrt{13} \left(\frac{5}{\sqrt{13}} \right) = 5 \text{ sq. units.}$$

Alternative Solution:

Let the parallelogram's vertices be A, B, C, D in that order:

By solving for the equations, we get A(1, 1), B(-1, 4), C(2, 2) and D(4, -1)

Lengths AB = BC = CD = DA

Hence, ABCD is a rhombus

$$\therefore \text{Area} = \frac{1}{2} AC \times BD = \frac{1}{2} \times \sqrt{2} \times 5\sqrt{2} = 5 \text{ sq. units}$$

Ans: (5)

Q22. DIRECTIONS for questions 22 and 23: Select the correct alternative from the given choices.

For $x > 1$ and $y > 1$, $x \diamond y = \frac{2x - y}{x + y}$, when $x > y$, and $x \diamond y = xy \diamond x$, when $x \leq y$. Find the value of $6 \diamond 8$.

a) $\frac{1}{2}$

b) $\frac{44}{7}$

c) $\frac{11}{7}$

d) $\frac{5}{3}$

$$6 \phi 8 = (6)(8) \phi 6 [\because 6 < 8] = 48 \phi 6 = \frac{2(48)-6}{48+6} [\because 48 > 6] = \frac{90}{54} = \frac{5}{3}.$$

Choice (D)

Q23. DIRECTIONS for questions 22 and 23: Select the correct alternative from the given choices.

How many circles exist in the x-y plane such that they touch both the coordinate axes and pass through the point (3, 6)?

a) 0

b) 1

c) 2

d) 3

The circle which touches both the axes will be of the form $(x - r)^2 + (y - r)^2 = r^2$ (i.e., centered at (r, r))

Since, the given circle also passes through (3, 6),

$$(3 - r)^2 + (6 - r)^2 = r^2$$

$$\Rightarrow 9 + r^2 - 6r + 36 + r^2 - 12r = r^2$$

$$\Rightarrow r^2 - 18r + 45 = 0$$

$$\therefore r = 3 \text{ or } 15$$

∴ There exist two circles which satisfy the given conditions.

Choice (C)

Q24. DIRECTIONS for question 24: Type in your answer in the input box provided in the question.

Let P represent the set of all natural numbers from 1 to 100, each of which differs from the sum of its factors by 1, and let Q represent the set of all natural numbers from 1 to 100, each of which is equal to the number of its factors. The L.C.M. of the greatest element of P and the greatest element of Q is

As P represents the set of all natural numbers from 1 to 100, whose value and sum of the factors differ by 1, all the elements in P are prime numbers. Hence the greatest element in P is 97. Q represents only the numbers 1 and 2. Hence the greater element of Q is 2.

∴ The required LCM is 194.

Ans: (194)

Q25. DIRECTIONS for questions 25 to 27: Select the correct alternative from the given choices.

P, Q, R, S and T are five boys who were asked to come, one at a time, and make a presentation. In how many ways is it possible that P makes his presentation before Q, and Q, before R?

- a) 10
- b) 20
- c) 15
- d) 30

The five boys can be arranged amongst themselves in $5!$ i.e., 120 ways. Now among P, Q and R, there are $3!$ arrangements possible and each of these 6 possibilities are equally likely to occur.

1. P Q R
2. P R Q
3. Q P R
4. Q R P
5. R P Q
6. R Q P

Of these only the first case satisfies the criterion asked. So $\frac{120}{6}$ i.e., 20 ways are there in which the given condition will be satisfied.

Alternative Solution:

If the order P, Q and R is fixed, then one of the remaining two (say S) can come in four possible places as shown below

___ P ___ Q ___ R ___.

The last person (T) can then be arranged in any of five possible places (similar to that above).

Hence, $4 \times 5 = 20$.

Choice (B)

Q26. DIRECTIONS for questions 25 to 27: Select the correct alternative from the given choices.

The ratio of the present ages of Ajay and Vijay is 7 : 3. If thirteen years ago, the ratio of their ages was 9 : 2, what would be Vijay's age 16 years from now?

a) 37

b) 36

c) 28

d) 43

Let the present ages of Ajay and Vijay be $7x$ and $3x$.

Thirteen years ago, their ages were $7x - 13$, $3x - 13$ respectively

$$\frac{7x - 13}{3x - 13} = \frac{9}{2}$$

$$14x - 26 = 27x - 117$$

$$13x = 91$$

$$x = 7$$

Present Ages are 49 and 21 years. After sixteen years, their ages would be 65 and 37 years.

Choice (A)

Q27. DIRECTIONS for questions 25 to 27: Select the correct alternative from the given choices.

Anju and Bobby simultaneously started climbing up an ascending escalator (a moving staircase). Since they were in a hurry, they also started climbing up the steps (taking one step at a time). Anju took k steps in the time that Bobby took 1 step, where k is an integer greater than 1. How many values can k take, if it is known that the speed of the escalator was the same as that of Bobby and Anju took a total of 72 steps to climb up the escalator? (Assume that the number of steps taken by Bobby was also an integer)

a) 5

b) 8

c) 9

d) 11

In the time Anju takes 72 steps, Bobby would take $\frac{72}{K}$ steps. So, the difference in the distance covered by them at this instant will be $72 - \frac{72}{K}$ steps.

Since speed of Bobby and that of the escalator are the same, half of $\left(72 - \frac{72}{K}\right)$ will be covered by Bobby and the remaining half by the escalator, for Bobby to fully climb up the escalator.

$$\text{Total number of steps taken by Bobby} = \frac{72}{K} + \frac{1}{2} \left(72 - \frac{72}{K}\right) = \frac{36}{K} + 36$$

$\therefore K$ must be a factor of 36, except 1, i.e., K can take $(9 - 1) = 8$ values.

Choice (B)

Q28. DIRECTIONS for question 28: Type in your answer in the input box provided below the question.

The average weight of the students in a class is 45 kg. If a group of 15 students, with an average weight of 60 kg, joins the class, the average weight of the entire class increases to 50 kg. What is the initial number of students in the class?

Let the initial number of students be x .

$$x \times 45 + 15 \times 60 = (x + 15) \times 50$$

$$\Rightarrow 45x + 900 = 50x + 750$$

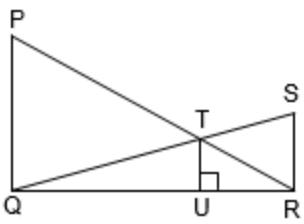
$$\Rightarrow 5x = 150$$

$$\therefore x = 30$$

Ans: (30)

Q29. DIRECTIONS for question 29: Select the correct alternative from the given choices.

In the figure below, $\angle PQR = \angle SRQ = 90^\circ$. If $SR : PQ = 1 : 4$, find $SR : TU$.



a) $6 : 5$

b) $4 : 3$

c) $3 : 2$

d) $5 : 4$

Triangles TUR and PQR are similar

$$\therefore \frac{PQ}{TU} = \frac{QR}{UR} \dots\dots (1)$$

Triangles QUT and QRS are similar

$$\therefore \frac{SR}{TU} = \frac{QR}{QU} \dots\dots (2)$$

$$(1) \div (2) \Rightarrow QU = 4UR$$

$$\therefore \frac{QR}{QU} = \frac{5}{4}$$

$$\therefore \frac{SR}{TU} = \frac{5}{4}$$

Choice (D)

Q30. DIRECTIONS for question 30: Type in your answer in the input box provided below the question.

A starts a certain work and after he completes exactly half the work, he leaves and B takes up the remaining work and it takes a total of 25 days for the work to be completed this way. If A and B working together can complete the work in 12 days, and A is slower than B, then find the number of

days in which the work will be completed, if A alone first works on exactly one-fifth of the work, after which B alone completes the rest of the work.

Let the number of days taken by A alone and B alone be a and b respectively. Since each of A and B worked on exactly half the work and finished it in 25 days

$$\frac{a}{2} + \frac{b}{2} = 25 \Rightarrow a + b = 50 \quad \text{--- (1)}$$

Also, together they take 12 days.

$$\Rightarrow \frac{ab}{a+b} = 12 \quad \text{--- (2)}$$

Solving (1) and (2), $a = 30$, $b = 20$ (since A is slower)

Now, if A completes $\frac{1}{5}$ th of the work, and B does the remaining $\frac{4}{5}$ th, we get

$$\frac{1}{5} \times 30 + \frac{4}{5} \times 20 = 6 + 16 = 22 \text{ days.}$$

Ans: (22)

Q31. DIRECTIONS for question 31: Select the correct alternative from the given choices.
A number when divided by 17 leaves a remainder of 7. Which of the following could be the remainder when the number is divided by 85?

a) 25

b) 43

c) 58

d) 72

The number is of the form $17k + 7$. When divided by 85, the possible remainders are 7, 24, 41, 58 and 75. Out of these only 58 occurs in the answer options. We get the remainder by substituting all the values of k starting from 0. Choice (C)

Q32. DIRECTIONS for questions 32 to 34: Type in your answer in the input box provided below the question.

If $x + y = z + 6$, where $x > 0$, $y > 0$ and $z < 0$, what is the maximum value of xy^3z^2 ?

$x + y = z + 6$ where $x > 0$, $y > 0$ and $z < 0$

Let $w = -z$. $\therefore x + y + w = 6$. (1), where $x > 0$, $y > 0$, $w > 0$.

We need the maximum value of xy^3w^2 ($z^2 = w^2$)

We need to split the y in (1) into 3 parts and the w into 2 parts.

$$(1) \Rightarrow x + 3\left(\frac{y}{3}\right) + 2\left(\frac{w}{2}\right) = 6$$

The sum of these 6 positive parts $\left(x, \frac{y}{3}, \frac{y}{3}, \frac{y}{3}, \frac{w}{2}, \frac{w}{2}\right)$ is constant. The maximum value of the product occurs when they are all equal (and therefore equal to 1)

$$\text{i.e. } x = 1, \frac{y}{3} = 1 \text{ and } \frac{w}{2} = 1$$

The maximum value of xy^3z^2 is $1(3^3)(2^2) = 108$.

Ans: (108)

Q33. DIRECTIONS for questions 32 to 34: Type in your answer in the input box provided below the question.

If $f(x \cdot y) = f(x) \cdot f(y)$, where $x > 0$ and $y > 0$, and $f(128) = 8$, find the value of $f(1) \cdot f(2) \cdot f(4) \cdot f(8) \cdot f(16) \cdot f(32) \cdot f(64)$.

Since, $f(x.y) = f(x).f(y)$

We get

$$f(1.y) = f(1) f(y)$$

$$\Rightarrow f(1) = 1$$

Also,

$$\begin{aligned} & f(1).f(2).f(4).f(8).f(16).f(32).f(64) \\ &= f(1).[f(64).f(2)].[f(32).f(4)].[f(16).f(8)] \\ &= f(1).f(128).f(128).f(128) = 1 \times 8 \times 8 \times 8 = 512 \end{aligned}$$

Alternative Solution:

If $f(x.y) = f(x).f(y)$, then we can consider $f(x) = x^n$

$$f(128) = 128^n = 8$$

$$2^{7n} = 2^3$$

$$n = 3/7$$

$$\therefore f(x) = x^{3/7}$$

$$\begin{aligned} & f(1) f(2) f(4) \dots f(64) \\ &= 1 \times 2^{3/7} \cdot 4^{3/7} \cdot 8^{3/7} \cdot 16^{3/7} \cdot 32^{3/7} \cdot 64^{3/7} = 512 \end{aligned}$$

Ans: (512)

Q34. DIRECTIONS for questions 32 to 34: Type in your answer in the input box provided below the question.

If K is a natural number and $(K^2 - 10K + 21)(K^2 - 9K + 20) = 240$, find K .

$$\text{Given } (K^2 - 10K + 21)(K^2 - 9K + 20) = 240$$

$$\Rightarrow (K - 3)(K - 7)(K - 4)(K - 5) = 240$$

This is of the form $A(A + 2)(A + 3)(A + 4)$, where $(K - 7) = A$.

Now, factorising 240 as $2^4 \times 3 \times 5 = 2 \times 4 \times 5 \times 6$ we can see that, for $K = 9$, we get

$$(K - 7)(K - 5)(K - 4)(K - 3) = 2 \times 4 \times 5 \times 6 = 240$$

\therefore The value of K is 9.

Since, K is a natural number, and since all four terms on the LHS are positive for $K \geq 9$, this is the only possible value of K (because for any value of $K > 9$, the product will be greater than 240).

Ans : (9)

