

T.I.M.E.Triumphant Institute of
Management Education Pvt. Ltd.**(Key and Solutions for AIMCAT1819)****Key****SECTION – I**

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Solutions**SECTION – I****Solutions for questions 1 to 6:****Number of words and Explanatory notes for RC:**

Number of words: 524

1. The author talks about the development of economic theory at the beginning of the passage. He mentions that "This methodological basis may be adequate for the development of pure mathematics, but it is sorely inadequate for developing economic theory".

Option A: The author mentions that both mathematicians and mathematical economists both interpret their symbols. Further, he calls the symbols of mathematical economists as "the undefined terms of their theories". But he does not mention that the symbols of one is more defined than the other. Further, this is not an inadequacy in the methodological basis of mathematics.

Option B: While talking about developing economic theory, he does not talk about statistical models. Therefore, this is not related to the question.

Option C: According to the author, "To be adequate, an interpretation of the symbols of an economic theory must describe at least one situation in which the empirical

relevance of the theory can be tested". However, the methodological basis for mathematics "provides no guidelines for formulating such an interpretation". Hence, this is the inadequacy that the author mentions at the beginning of the paragraph.

Option D: While the author does mention that "the methodological basis of mathematics is not equipped to deal with philosophical problems", he mentions this when talking about why the methodological basis for mathematics is not adequate for econometrics. The author does not mention this inadequacy when talking about developing economic theory in the second paragraph. Hence, this option is incorrect.

Therefore, the correct answer is option C. Choice (C)

2. The author talks about Haavelmo's work in the third paragraph of the passage. He describes the issues that Haavelmo addressed in his work in the same paragraph.

Option A: The author mentions that Haavelmo "discusses the nature of stochastic models and their applicability to economic data". Hence, this option is mentioned in the passage.

Option B: The author also mentions that he "outlines a general scheme for testing economic theories". Hence, this is also mentioned in the passage.

- Option C: In his book, "Haavelmo delineates the relationship between abstract economic theories and economic reality". Hence, this is not the correct answer.
- Option D: The author does not mention that Haavelmo compared stochastic models with other statistical models for economic data. Hence, this is not mentioned in the passage.
- Therefore, the correct answer is option D. Choice (D)
3. The author talks about how Haavelmo's work "does not provide economic researchers with a formal theoretical apparatus that can guide them in formulating their statistical models". He then goes on to state that there is a need for such an apparatus.
- Option A: Choice A is out of context and is not what the sentence in quotes in the question implies. Hence, this option is incorrect.
- Option B: The author mentions that there is a need for such an apparatus. We can infer from the author's statement that because there is no such apparatus, there is an "ample supply of meaningless estimates of statistical parameters in economic journals". Hence, we can infer that there isn't any notable framework which provides guidelines for formulating statistical models in economics.
- Option C: The author mentions that there is an "ample supply of meaningless estimates" because there is no apparatus for guiding the econometrists. He does not mention that the econometrists select variables unrelated to the data at hand. This is too specific and cannot be inferred from the passage.
- Option D: The author mentions that Haavelmo's work "does not provide economic researchers with a formal theoretical apparatus". This statement is false as it mentions that Haavelmo provided such an apparatus in his work.
- Therefore, the correct answer is option B. Choice (B)
4. The author compares the methodological basis of pure econometricians and nonintuitionistic mathematicians in the last paragraph of the passage.
- Option A: The author does not compare the statistical models used in the two fields. Hence, this is not the correct answer.
- Option B: The author mentions that "Philosophical problems concerning the possibility of economic knowledge are as much a part of econometric theory" as statistical models. However, he does not say that epistemological variables must be included in statistical models. Hence, this option is incorrect.
- Option C: The author mentions that methodological basis of econometrics must be able to deal with philosophical problems. He states that "Since the methodological basis of mathematics is not equipped to deal with philosophical problems, it is inadequate for the purposes of econometrics". Therefore, this is the correct answer.
- Option D: The author clearly mentions how the methodological basis of econometrics must be different from that of nonintuitionistic mathematics and hence, this is not the correct answer.
- Therefore, the correct answer is option C. Choice (C)
5. I: The author compares the methodological basis of mathematics and pure theorists in the second paragraph of the passage and finds the former inadequate.
- II: In the final paragraph, he compares the methodological basis of mathematics and pure econometricians and find the former inadequate.
- III and IV: He does not compare the methodological basis of mathematics and applies economists and applied econometricians. He only talks about Haavelmo's work and how this work has a few inadequacies.
- V: The author mentions a fourth group of economists in the first paragraph – government policy makers, economic consultants, and bank employees. He does not talk about their methodological considerations in this passage.
- Therefore, the author finds that the methodological basis of mathematics inadequate for pure theorists and pure econometricians. Hence, the answer is option A.
- Choice (A)
6. The passage mentions the four groups of economists in the first paragraph of the passage. According to the passage, most of the work of pure econometricians "belongs in the realm of mathematical statistics". The published work of applied economists and applied econometricians "usually reports results from the analysis of economic data".
- Option A: The passage does not talk about "real world economic data". It only mentions about economic data when talking about pure econometricians and applies econometricians. Hence, this option cannot be inferred from the passage.
- Option B: From the latter part of the third paragraph, we can infer that applied econometricians formulate statistical models. However, according to the author, Haavelmo's work "does not provide economic researchers with a formal theoretical apparatus that can guide them". In the given option, the first part of the option may be true (but cannot be inferred from the passage) and the second part is false. Hence, this is not the correct answer.
- Option C: When talking about pure econometricians in the last paragraph of the passage, the author mentions that "Econometrics is the theory of how to measure economic relations". Hence, we can infer that pure econometricians concentrate on measurement of economic relations. At the beginning of the passage, the author mentions that The published work of applied economists and applied econometricians "usually reports results from the analysis of economic data". Hence, this is the correct answer.
- Option D: The author mentions that pure econometricians must deal with philosophical problems along with statistical models. Hence, this option is incorrect.
- Therefore, the correct answer is option C. Choice (C)

Solutions for questions 7 to 12:

Number of words and Explanatory notes for RC:

Number of words: 557

7. The author mentions that "the label "realistic" characterizes the *psychological force* or emotional persuasiveness of certain images". He further states that "images made in other media can be realistic in this psychological sense without being literally accurate or mechanically caused in the way photographs are".

Statement I: A realistic painting of a person can be an example of realism in other media. The author mentions the example of a photograph of his dead grandmother in the passage. We can infer that a painting which is similar to the photograph will invoke the same emotions. Hence, this is one of the examples.

Statement II: The author mentions that an image can be "realistic in this psychological sense without being literally accurate". Here, the painter is using his imagination of something that is real. Hence this can also be an example.

Statement III: An abstract painting by definition does not represent reality and hence, this cannot be an example.

Statement IV: A photograph cannot be an example of image in "other media" because the author primarily talks about photographs in this paragraph.

Hence, only I and II are examples of images in other media.

Choice (A)

8. The author mentions two different types of realism associated with photographs: epistemic value and psychological force. Towards the end of the passage, he compares his distinction of realism in images with Maynard's distinction. Representative function, according to Maynard, is present in Western European Art. Manifestation function was associated with art in Eastern Europe. We can infer from this paragraph that the "naturalistic, illusionistic depiction" in Western Art refers to the epistemic value as described by the author. The art in Eastern Europe which provides "realism through the sense of presence" refers to the psychological force.

Option A: The epistemic value of an image was central to the Western European art as this art developed naturalistic depiction. Hence, this is incorrect.

Option B: He mentions that realism characterizes psychological force which is what affects us emotionally. Hence, this option is also incorrect.
 Option C: In Western Europe, "art associated mainly with Catholicism developed forms of ever more naturalistic, illusionistic depiction". Hence, this is the correct answer.
 Option D: The epistemic value of an image implies that an image "has a particular kind of accuracy or that it is a truthful representation". Hence, this option is also incorrect. Therefore, the correct answer is option C. Choice (C)

9. The first paragraph of the passage talks about why photographs are considered "inherently realistic".

Option A: The author mentions that "photographs are emanations from their subject matter or little bits of reality rather than representations of it". Since photographs are considered bits of reality rather than representation of reality, they are used as evidence. But the option states that photographs can "represent reality" which is incorrect.

Option B: The author mentions that "photographic depiction can occur without the intervention of artistic intentions". However, this option is extreme and is not the correct answer.

Option C: The author mentions in the third paragraph that "images made in other media can be realistic in this psychological sense". Hence, this option is also incorrect.

Option D: Photographs are "emanations from their subject matter" and are considered little bits of reality. We can infer that the author refers to other forms of images (including paintings) when he says "representations of reality". Hence, this is the reason why photographs are used as evidence but paintings are not. Choice (D)

10. The author mention indexical signs in the second paragraph of the passage. Photography, along with other signs in nature, are called indexical signs because they "show a direct causal link to their source".

Option A: The passage does not mention that the signs are accepted as social convention. Hence, this option is irrelevant and cannot be the definition.

Option B: The author mentions that photographs "show a direct causal link to their source". The other examples also show a similar property. Hence, we can say that indexical signs show a direct causal link to their source. This is a relevant definition of indexical signs.

Option C: The author mentions measles spots (which probably indicates that a person has measles), footprints (which probably indicate that a person walked along a path) as indexical signs. In these cases, the signs do not possess the qualities of the signified object and hence, this is not an accurate definition.

Option D: In the examples that the author provided, the signs (i.e., photograph, footprints, teeth marks) is not responsible for the causation. It points to the occurrence of something that caused these signs. Hence, this is not the correct answer.

Therefore, the correct answer is option (B). Choice (B)

11. The author mentions that in photography, the image has an "epistemic value, implying that it has a particular kind of accuracy or that it is a truthful representation".

Option A: The ability to paint photo realistic pictures might, in a way, increase the epistemic value of paintings but will not lower the epistemic value of photographs.

Option B: The ability to capture intricate details in photographs will only make the images a more truthful representation of reality and hence, will increase the epistemic value of the photographs.

Option C: This will not affect the epistemic value of photographs in general.

Option D: The ability to digitally alter photographs implies that photographs cannot be considered to be truthful representations of reality. This will diminish the epistemic value of photographs.

Hence, the correct answer is option D. Choice (D)

12. The author talks about how Maynard identified two traditions in Europe – one in the West and one in the East.

Option A: This option talks about art in the *Western world* and *Eastern world*. However, the paragraph talks about traditions only in Europe. Hence, this option is incorrect.

Option B: This option also talks about Western world and Eastern world and hence, is not the correct answer.

Option C: The author mentions that in Eastern Orthodox realms, "manifestation has less to do with effecting a realistic likeness than with supplying the viewer with a sense of contact or presence with the represented subject". Since this option states the opposite, it is incorrect.

Option D: The author mentions that Western European art had "more naturalistic, illusionistic depiction". In Eastern Europe, "manifestation has less to do with effecting a realistic likeness than with supplying the viewer with a sense of contact or presence with the represented subject". Hence, this is the correct answer.

Choice (D)

Solutions for questions 13 to 18:

Number of words and Explanatory notes for RC:

Number of words: 713

13. Option A: The passage begins with the quotation: Every novel is an ideal plane inserted into the realm of reality. One is not sure what is perception and what is reality. Cervantes, who wrote Don Quixote, takes pleasure in confusing the objective and the subjective, the world of the reader and the world of the book. From the examples of Shakespeare's Hamlet (para 2) and *The Thousand and One Nights* (para 3) and the reference to maps (penultimate para), one can say that choice A is the answer. {This play of strange ambiguities culminates in the second part; the protagonists have read the first part, the protagonists of Don Quixote are, at the same time, readers of Don Quixote ---- the imperfect correspondence of the principal and secondary works lessens the efficacy of this inclusion.} {The Thousand and One Nights duplicates and reduplicates to the point of vertigo the ramifications of a central story in later and subordinate stories, but does not attempt to graduate its realities.}{There is no detail of the soil of England, no matter how minute, that is not registered on the map; everything has there its correspondence. This map should contain a map of the map of the map, and so on to infinity ...}

Option B: The penultimate para states: The inventions of philosophy are no less fantastic than those of art But choice B is not the focus of the passage.

Option C: The last para of the passage makes a suggestion. Why does it disturb us that Don Quixote be a reader of Don Quixote inversions suggest that *if the characters of a fictional work can be readers or spectators, we, its readers or spectators, can be fictitious*. But this suggestion has not been expanded by the author in the passage. It has not been explicitly mentioned as to what the relationship is. Choice C sounds like a far-fetched conclusion but it is not the central idea. So choice C is incorrect.

Option D: "duplicates and reduplicates to the point of vertigo the ramifications of a central story in later and subordinate stories" helps us infer that there can be conflationary (confusing or obfuscating) elements in novels. But the second part of choice D is a judgment that does not follow from the passage. Choice D is not the central idea of the passage.

Choice (A)

14. Option A: The central idea of the passage is that there is a relationship between the characters or protagonists of a novel and the readers of the same. This is also evident from the last para of the passage. Shakespeare's Hamlet is mentioned in para 2 ... the imperfect correspondence of the principal and secondary works lessens the efficacy of this inclusion. Something similar is created by accident in *The Thousand and One Nights*. Hence choice A is the answer.

Option B: The example of the 'barber' has been mentioned in para 1. The barber passes judgment on Cervantes. But the purpose behind adding "The Thousand and One Nights" excerpt to the passage is not to establish a mere correlation with the barber example. So choice B is incorrect.

Option C: The reference to maps in para 4 is to draw a parallel between 'art' and 'philosophy'. (The inventions of philosophy are no less fantastic than those of art). But choice C is not the purpose behind adding "The Thousand and One Nights" excerpt to the passage.

Option D: The passage does refer to the Persian Carpet when discussing *The Thousand and One Nights*. But choice D is besides the point.

Choice (A)

15. There are several clues in para 3 that help complete the blank. "Duplicates and reduplicates to the point of vertigo the ramifications of a central story in later and subordinate stories", "He hears the beginning of the story, which comprises all the others and also, monstrously itself", "numerous interpolations (insertions)", "does the reader clearly grasp the vast possibility of this interpolation", "hear forever the truncated story". These clues point to choice B as the answer. The remaining choices do not correctly capture the theme of para 3 and do not connect well with the previous portion of the last sentence. Choice (B)

16. Statement 1: The first part of statement 1 is hinted at in the passage. *The Thousand and One Nights* is an overdetermined narrative of magic, adventure, parable and poetry that, duplicates and reduplicates to the point of vertigo the ramifications gradate its realities. The second part of statement 1 is a viewpoint that cannot be inferred from the passage. Hence statement 1 is incorrect.
 Statement 2: The passage mentions how the readers of the Quixote could be reminded of Shakespeare's Hamlet (who includes on the stage of Hamlet another stage where a tragedy more or less like that of Hamlet is presented; the imperfect correspondence of the principal and secondary works lessens the efficacy of this inclusion.) Correspondence here alludes to the relation between the play Hamlet and the play that was part of it – its portrayal or presentation. The lines preceding this mention how this association has been used in Don Quixote too: the protagonists have read the first part, the protagonists of Don Quixote are, at the same time, readers of Don Quixote. Statement 2 is correct.

Statement 3: The priest and the barber inspect Don Quixote's library. One of the books examined is Cervantes' own Galatea and it turns out that the barber is a friend of the author and does not admire him very much. "The barber, a dream or the form of a dream of Cervantes" passes judgement on Cervantes. So, the barber is a creation of Cervantes. Sentence 3 can be inferred to be true from the passage.

Statement 4: The sentence in boldface is preceded by only a narration with no viewpoint of the author. The boldface sentence serves as a prelude to what comes next: who includes on the stage of Hamlet another stage where a tragedy more or less like that of Hamlet is presented, he imperfect correspondence of the principal and secondary works lessens the efficacy of this inclusion, overdetermined narrative that, duplicates and reduplicates to the point of vertigo the ramifications of a central story in later and subordinate stories, Scheherazade contrives an elaborate metafiction that potentially unhinges its internal drama curious danger truncated story, This map, in such a case, should contain a map of the map, which should contain a map of the map of the map, and so on to infinity Hence statement 4 is also true.

Statement 5: Statement 5 is true. The Persian carpet is mentioned in the third para. 'superficial effect of the narrative'. duplicates and reduplicates to the point of vertigo the ramifications of a central story in later and subordinate stories, but does not attempt to gradate its realities, and the effect (which should have been profound) is superficial, like a Persian carpet ... elaborate metafiction. Statement 5 is true of a story that is very involved, yet superficial.

Hence statements 2, 3, 4 and 5 are correct. Since four statements are true, the answer is 4. Ans: (4)

17. Option A: The opening story of the series is well known: the terrible pledge of the king who every night marries a virgin who is then decapitated at dawn. Hence choice A is true.

Option B: the resolution of Scheherazade, who distracts the king with her fables until a thousand and one nights have gone by and she shows him their son. Choice B is correct and is not the answer.

Option C: The overdetermined narrative duplicates and reduplicates to the point of vertigo the ramifications of a **central story in later and subordinate stories**, but does not attempt to gradate its realities, and the effect (which should have been profound) is **superficial**, like a Persian carpet. 'ostensible' means 'superficial'. Hence choice C is correct.

Option D: The sheer length of the piece obliged the story's many copyists over the centuries to make numerous interpolations, one of which marks a perturbing turn in this already vertiginous confection. "Interpolations" means insertions or additions, while 'preclusion' means 'exclusions'. So choice D is not correct and is the answer.

Choice (D)

18. Option A: A work of fiction is an idealization of the reality it exists within and still, it does not completely replicate the same – examples from Hamlet and *The Thousand and One Nights* help to highlight this point. In Hamlet, a tragedy more or less like that of Hamlet is presented; the imperfect correspondence of the principal and secondary works lessens the efficacy of this inclusion. *The Thousand and One Nights* duplicates and reduplicates does not attempt to gradate its realities and the effect is superficial like a Persian carpet. Choice A is correct and is the answer.

Option B: Choice B is false. Cervantes, who wrote Don Quixote, takes pleasure in confusing the objective and the subjective, the world of the reader and the world of the book. So the subjective is the world of the novel/ text and the objective is the world of the reader.

Option C: Works of fiction can be inspired by the author's perception of reality. The nature of a work of fiction can seem infinite in its efforts to represent itself, but this does not imply that objective and subjective work in tandem to bring about the same. So choice C is not the answer.

Option D: The first part of choice D is not true. For example, the passage does not discuss Shakespeare's thought process in composing Hamlet. The second part cannot be inferred. It has only been given in the passage that "The barber, a dream or the form of a dream of Cervantes passes judgement on Cervantes." Hence choice D is not the answer.

Choice (A)

Solutions for questions 19 to 21:

Number of words and Explanatory notes for RC:

Number of words: 316

19. In the second paragraph of the passage, the author states that "As the price of computer monitors plummeted over the last decade, studies showed that increasing display size increased people's productivity. It didn't seem to matter that the research was sponsored by NXC".

Option A: The author implies that since NXC sponsored the research, the studies loses some of its credibility. We can infer from this that NXC would stand to gain if people used more monitors. This option is incorrect as it states the opposite.

Option B: While this may be true, we cannot infer that NXC's primary source of revenue is from monitors. We can only infer that NXC probably sells monitors. Hence, this option is a little far-fetched and is incorrect.

Option C: The author implies that it is in the interest of NXC that people use more number of monitors, since the author states that "it didn't seem to matter that the research was sponsored by NXC". Hence, this option can be inferred from the passage.

Option D: We cannot infer the objective of NXC in sponsoring the study. Hence, this option cannot be inferred from the passage.

Hence, the correct answer is option C. Choice (C)

20. In the penultimate paragraph, the author mentions that in using a single screen system, he "found something increasingly elusive in our multiscreen world: focus".

Option A: The author does not talk about the strain that our eyes are subjected to in a multiscreen system. Hence, this is not the correct answer.

Option B: According to the author, in a multiscreen system, there are "too many simultaneous stimuli", which reduces focus. Hence, a disadvantage of a multiscreen system is that it is easier to be distracted because of the large amounts of visible information.

Option C: The author mentions in the last paragraph that "extra monitors might increase productivity in certain situations". Hence, this is not a disadvantage.

Option D: The author does not compare ease of organizing work in single screen systems and multiscreen systems. Hence, this cannot be inferred from the passage.

Therefore, the correct answer is option B. Choice (B)

- 21.** The author says, "Two months ago, about five years after becoming an ardent proselytizer for the Church of the Second Display, I turned off the extra screen on my desktop computer." This means that (i) five years ago is when he started to strongly advocate the use of multiscreen systems, (ii) two months back is when he went back to using a single screen.

Option A: We cannot infer from the passage when the author started using a multiscreen system. He became a strong advocate of it five years ago but he might have been using it for a longer time. Hence, this is not the correct answer.

Option B: Towards the end of the passage, the author mentions that he is able to focus more using a single screen system. His views mentioned in the last paragraph do not support this option.

Option C: We cannot infer for how long the author used a two screen system. Hence, this is incorrect.

Option D: Five years ago, the author became an "ardent proselytizer" for two screen system. But he switched to a single screen system now. Hence, this option is the correct answer.

Choice (D)

Solutions for questions 22 to 24:

Number of words and Explanatory notes for RC:

Number of words: 500

- 22.** Option A: Refer to the second paragraph. Sometimes, the chromosome number will double (as they normally do in preparation for cell division) but the cell fails to divide. Then the diploid cell becomes tetraploid with four sets of chromosomes. Refer to the third paragraph. Polyploid is the general term that describes any organism with more than two sets of chromosomes. Sometimes the complications become too much even for the plants and they finish up with an odd number of chromosomes. The term 'complication' refers to the lack of cell division. Hence choice A is the answer.

Option B & C: Cell divisions and matings are events when chromosomes in plants may be lost and they finish up with an odd number of chromosomes. Choices B and C are not related to the term 'complication' used by the author in para 3. 'Mating' has been implicated in the 'endless complications' mentioned in the penultimate para.

Option D: Due to incompatible chromosomes, the cells may not be able to produce sound gametes and this results in 'further complications' as discussed in para 4. Diploid organisms that are of different species sometimes mate to produce fully viable offspring. But usually such crosses fail. Choice D is not responsible for the 'complications' used by the author in para 3.

Choice (A)

- 23.** (1): European potatoes are tetraploid as compared to the Andean potatoes that are diploid. So (1) is not correct.
 (2): The cultivated banana is triploid. Because it is sterile, its fruits contain no seeds (as wild banana fruits do). Triploids are sterile. Hence we can infer that wild bananas are not triploid. So (2) is not true.

(3): Refer to the last para. Triploid hybrids double their chromosomes to become hexaploid (with six sets of chromosomes). The most famous and important hexaploid organism of all is bread wheat.

Therefore (3) is not a correct match.

(4): From the last para, we know that pasta wheat is diploid. So (4) is not a correct pair.

(5): Sugarcane is said to be aneuploid in the last sentence of para 3. So (5) is a correct pair.

(6): From the first para, we know that humans and chimpanzees are diploid. Hence (6) is not correct.

As we have seen above, there is only one plant: sugarcane for which the polyploidy status is mentioned correctly. Hence the answer is 1.

Ans: (1)

- 24.** Option A: Refer to para 2. The newly formed tetraploid organism can breed successfully with other tetraploids of its own kinds but it cannot breed successfully with either of its parents. The octoploids form new species – unable to interbreed with the tetraploid parents that formed them. Hence choice A is true and is not the answer.

Option B: From the third para, sugarcane is aneuploid but that does not stop it being a vigorous major crop. The penultimate para mentions that the cultivated banana is triploid. Because it is sterile, its fruits contain no seeds (as wild banana fruits do). So the domestic banana has to be produced vegetatively, by planting cuttings. So choice B is a distortion and is the answer.

Option C: Diploid organisms that are of different species mate to produce fully viable offspring. The chromosomes of the two parents are incompatible. ... The cells will not produce sound gametes (eggs and sperm, or ovules and pollen) because this requires close cooperation between chromosomes. Refer to the penultimate para. Diploid parents of different species mate to produce diploid, hybrid offspring that are sterile; but the hybrids then double their chromosomes and become tetraploid – and the hybrid tetraploids are then fertile. Therefore Choice C is true and is not the answer.

Option D: From the penultimate para, we can infer that choice D is true. Hence choice D is not the answer.

Choice (B)

Solutions for questions 25 to 29:

- 25.** On a careful reading of the sentences, it can be observed that sentence 2 is a general sentence that begins the paragraph. It has a comment given in quotes. Sentence 4 follows sentence 2 as 'that' in sentence 4 links with the comment mentioned in sentence 2. Sentence 4 has the full name of the organization. Sentences 4 and 1 form a mandatory pair. 'The Extraditables' in sentence 1 links with 'Los Extraditables' in sentence 4. Sentence 1 provides details about the Extraditables and follows sentence 4. So, 241. Sentence 1 is followed by sentence 3. Having talked about the fear of extradition in sentence 1, it would seem appropriate to proceed to the reason for that fear as given in sentence 3. "mounted a campaign of violence to get Colombia to ban extradition" given earlier in sentence 1 links with "prison sentence abroad" in sentence 3. Sentence 3 is followed by sentence 5 which provides the desired alternative. "At home they could run their businesses from behind bars" in sentence 5 contrasts "a prison sentence abroad real hard time" in sentence 3. Sentence 5 concludes the paragraph. So, 24135.

Ans: (24135)

- 26.** On a careful reading of the sentences, it can be observed that sentence 5 is a general sentence that begins the paragraph. It introduces the background of the paragraph. "rarely happen in real life as they do in the movies" in sentence 5 links with "some engine part does not explode the rudder doesn't snap" in sentence 1. Sentence 4 (Moreover, the captain doesn't gasp) provides another detail exemplifying how plane crashes in real life are not what they are in the movies. So sentences 1 and 4 in that order justify the point made in the introduction sentence 5.

Sentence 3 follows sentence 4. "the typical commercial jetliner is about as dependable as a toaster" in sentence 3 follows sentence 4. Sentence 2 tells us how plane crashes are likely to be caused in real life. Sentence 2 concludes the paragraph. So, 51432.
Ans: (51432)

27. On a careful reading of the sentences, it can be observed that sentence 1 is a general sentence that begins the paragraph. Sentence 1 presents a general truth. The remaining sentences specifically deal with 'enemy-centering'. Sentence 1 is followed by sentence 4 which poses a question. Sentence 4 is followed by sentence 5. "Most people would never think of it" in sentence 5 links with "what about putting an enemy at the center of one's life?" in sentence 4. So, 145. Sentences 5 and 2 form a mandatory pair. The conjunctive adverb 'nevertheless' in sentence 2 contrasts the point made in sentence 5. "people would never think of it, and probably no one would ever do it consciously" in sentence 5 contrasts "enemy centering is very common" in sentence 2. Sentences 2 and 3 form a mandatory pair. "when there is frequent interaction between people who are in real conflict" in sentence 2 links with "counterdependently reacting to the behaviour and attitudes of a perceived enemy" in sentence 3. Sentence 3 (enemy-centered person is counterdependently reacting to the behaviour and attitudes of a perceived enemy) stresses a similar point made earlier in sentence 1 (become preoccupied with the injustice and make the other person the center of his life). Sentence 3 concludes the para. So, 14523.
Ans: (14523)

28. On a careful reading of the sentences it can be observed that sentence 3 is a general sentence that begins the paragraph. It introduces the background: Chinese number words are remarkably brief. Sentence 3 is followed by sentence 1. "English equivalents - "four" and "seven" are longer: pronouncing them takes about one-third of a second" in sentence 1 contrasts "Chinese number words are **remarkably brief**: most of them can be uttered in less than one-quarter of a second" in sentence 3. Sentence 5 follows sentence 1. "this difference in length" in sentence 5 has been pointed out in the sentences 3 and 1. Sentence 5 introduces a new term "memory gap". Sentences 5 and 2 form a mandatory pair. "Memory gap entirely due to this difference in length" in sentence 5 links with "reproducible correlation between the time required to pronounce numbers in a given language and the memory span of its speakers" in sentence 2. Sentences 2 and 4 form another mandatory pair. "memory span of its speakers" in sentence 2 links with " a rocketing memory span" in sentence 4. Sentence 4 concludes the paragraph. So, 31524.
Ans: (31524)

29. On a careful reading of the sentences it can be observed that sentence 1 is a general sentence that begins the paragraph. It tells us what a summer break *usually meant* in communist times. Sentence 4 follows sentence 1. "when the red flag came down" points to the end of communism. So, "red flag came down" in sentence 4 contrasts "communist times" in sentence 1. "trip with workmates to a stony beach or a bracing mountainside--within the Soviet motherland" in sentence 1 contrasts "Russians flew off en masse on exotic forays to Turkey or Thailand" in sentence 4. Sentence 4 which talks about the past ("Russians **flew**") is followed by sentence 2 which talks about the present "**Now** the pleasure of holidaying closer to home". Sentences 2 and 5 form a mandatory pair. "**these citizens** are *nevyezdniye*" in sentence 5 points to "ever-growing category of citizens" in sentence 2. Also "forbidden, by virtue of their state employment or access to secrets, from going abroad" in sentence 5 links with "Now the pleasure of holidaying closer to home is **perforce** (necessarily or inevitably) being rediscovered" in sentence 2. Sentence 3 continues after sentence 5 and concludes the paragraph. "froideur" in sentence 3 means "coolness or reserve (between people or countries)". So, 14253.
Ans: (14253)

Solutions for questions 30 to 32:

30. On a careful reading of the sentences it can be observed that sentence 2 is a general sentence that begins the paragraph. It tells what the Olympic motto is as well as its latin translation. Sentence 4 follows sentence 2 as the pronoun 'it' in sentence 4 points to the Olympic motto mentioned in sentence 2. Coubertin's full name is given in sentence 4. Sentence 1 follows sentence 4. Coubertin's complete name is not mentioned in sentence 1. "these three words" in sentence 1 point to "*Citius, Altius, Fortius*" mentioned in sentence 2. "explained to the Committee members" in sentence 1 follows from "creation of the International Olympic Committee in 1894" in sentence 4. Sentence 5 talks about another well-known motto (related to sports), introduced by Coubertin and concludes the paragraph. So, 2415. Sentence 3 does not refer to the Olympic motto as such. It is a random statement about olympic symbols and is the odd sentence out. Ans: (3)
31. On a careful reading of the sentences it can be observed that sentence 4 is a general sentence that begins the paragraph. It introduces the term "feud" and the background "family fights another". Sentences 4 and 3 form a mandatory pair. "one family fights with another" in sentence 4 links with "When lots of families fight with one another mountain range" in sentence 3. Sentence 5 follows sentence 3. "the Appalachian pattern" in sentence 5 points to "a pattern" in sentence 3. Sentence 5 (What was the cause?) is linked with sentence 2 (The consensus reached). So sentence 2 follows sentence 5. "that region" in sentence 2 points to "Appalachian" in sentence 5. So, 4352. Sentence 1 is the odd sentence out as it will need a precedent and further clarification. It can come later in the flow.
Ans: (1)

32. On a careful reading of the sentences it can be observed that the sentences talk about the time taken in fighting a disease. Sentence 5 is a general sentence that begins the paragraph. It introduces the name of the disease "guinea worm" and the topic of discussion "time spent fighting a disease should not be measured in human years, but in the disease's lifespan". Sentence 3 follows sentence 5 as it explains the situation with another disease "smallpox". Sentence 3 also has the full name of the scientist: Donald Hopkins. Sentence 2 reiterates the situation with guinea worm. Sentence 2 (With guinea worm it takes a year to know) follows sentence 3 (With smallpox, the incubation period was two weeks). Sentence 1 concludes the para after the comparative statements 3 and 2. "Hopkins' decades fighting guinea worm are the same as just over a year spent tackling smallpox" in the conclusion sentence 1 mirrors the point in the introduction "time spent fighting a disease should not be measured in human years, but in the disease's lifespan". Sentence 4 runs tangent to the paragraph as it focuses on countries where the guinea worm exists and not on " time spent fighting a disease disease lifespan". Sentence 4 is the odd man out.
Ans: (4)

Solutions for questions 33 and 34:

33. On a careful reading of the sentences, it can be observed that the paragraph begins with defining 'conscience' and then goes on to talk about the 'education of the conscience'. A list of requirements for educating the conscience have been mentioned in the penultimate sentence of the paragraph. "Feasting on **inspiring literature**, thinking noble thoughts and living in harmony" in choice B closely parallels "**greater concentration**, more balanced discipline of the mind and life, more consistently honest living" in the penultimate sentence of the para. Hence choice B is the answer. Choice A goes back to 'conscience' but does not complete the theme of the last few sentences of the para: educating the conscience. Choice C is negative in tone and cannot continue with the positive points mentioned in the penultimate sentence of the para. Choice D leaves the thought flow incomplete.
Choice (B)

34. The paragraph talks about 'darkness' and how it can fascinate people. It gives us a plethora of feelings or responses of people towards the 'nocturnal'. 'nocturnal has continually fascinated artists' in the penultimate sentence links with the point of view in choice A. Choice A tells us of what artists have turned out, resulting from their fascination with the nocturnal.

Choice B can come only after choice D.

'each of these pieces' in choice C needs a precedent. Choice C does not connect with the penultimate sentence of the para.

In choice D, a particular exhibition is being discussed. But choice D does not talk about the theme of the 'nocturnal' in art (it refers to 'themes' of art) and even if it did, choice D would be a progression from choice A. Choice (A)

Difficulty level wise summary - Section I	
Level of Difficulty	Questions
Very Easy	19
Easy	20, 21, 23
Medium	2, 15, 17, 30
Difficult	1, 3, 7, 8, 10, 11, 12, 13, 14, 16, 18, 22, 24, 26, 33, 34
Very Difficult	4, 5, 6, 9, 25, 27, 28, 29, 31, 32

SECTION – II

Solutions for questions 1 to 4:

1. Given that 59 students joined in 2009. In 2009, the students with ID numbers 170 to 246 would have passed out of the college. The 59 students who joined in 2009 would be assigned ID numbers 170 to 228. In 2010, students with ID numbers 86 to 169 would pass out of the college. The 61 students who joined in 2010 would be assigned 86 to 146. The students with ID numbers 47 to 85 would pass out of the college in 2011. The 64 students who joined in 2011 will be assigned ID numbers 47 to 85, 147 to 169 and 229 to 230. The students who were in first year in 2011 will be in the second year in 2012. From the given options, the student with ID number 230 will be in the second year in 2012. Choice (D)

2. In 2009, the students with ID numbers 170 to 246 would have passed out. Since x students joined, the ID numbers of these students will be 170 to $170 + (x - 1)$. In 2010, the students with ID numbers 86 to 169 will pass out. Since a student who joined in the next year was given an ID number of 158, the number of students who joined in 2010 (i.e., x) can be at most 72. Only then the ID numbers of these students will be at most 157. Since x students joined in 2010, the ID numbers of these students will be from 86 to $86 + (x - 1)$. In 2011, the students with ID numbers 47 to 85 would have passed out. For a student who joined in 2011 to have an ID number of 158, more than 39 students must have joined. The first 39 students will be given ID numbers from 47 to 85. The other $(x - 39)$ students will be given ID numbers from $86 + (x - 1) + 1$ to $86 + (x - 1) + (x - 39)$. The latter value must be 158 for x to be minimum. Hence,
- $$86 + (x - 1) + (x - 39) = 158 \Rightarrow 46 + 2x = 158 \Rightarrow x = 56$$
- The minimum value of x is 56. Choice (C)

3. If a student was in third year in 2012, he must have joined the college in 2010. In 2010, he was provided with an ID number of 245. The IDs of the students who passed out in 2010 would be from 86 to 169. The IDs from 170 onwards will belong to students who joined in the previous year. If this ranges from 170 to x , the IDs of students who joined in 2010 will range from x to 245 (since we are minimizing the number of students who joined). Hence, a total of 160 students must have joined the college in 2009 and 2010. In 2011 and 2012, it is not necessary that any student join the college. Hence, the minimum number of students that joined the college during the given period is 160. Choice (A)

4. Option I: The first 84 students who joined in 2010 will be provided IDs from 86 to 169. If only 73 students joined in this year, their ID numbers will range from 86 to 158. The ID number 159 will be provided to a student who joined in 2011 if sufficient number of persons join. Hence, this is possible.

Option II: If a student was provided an ID number of 141 in 2010, then definitely the student with ID number of 140 would also have joined in 2010. Hence, this is not possible.

Option III: This combination is possible because the students who joined in 2010 and 2011 will be provided ID numbers starting from 86 and 47 respectively.

Option IV: If a student who joined in 2010 was given an ID number of 189, this implies that all the ID numbers from 86 to 169 are assigned. Hence, any student who joined in 2011 cannot be provided an ID number of 158. Hence, this is also not possible.

Therefore, only two options are possible. Choice (B)

Solutions for questions 5 to 8:

From (iii), Kiran's score before the beginning of Quickfire round was 60. This is possible only if he scored the following points in the previous rounds: (30, 30); (50, 10); (30, 15, 15); (30, 10, 10, 10); (15, 15, 15, 15).

Given that Kiran's score at the end of Connect round was 20 more than his score at the end of Match round. For Kiran to score 20 point between these rounds, he must have score 10 points in 2 rounds. Hence, he must have scored 10 points in the round immediately after Match and must have scored 10 points in Connect round which will be two rounds after Match.

Match can be the first, second or the third rounds (since Connect is two rounds after Match). If Match is the first round, then in the second and third rounds, he must have scored 10 points. From (i), Kiran must have score more number of points in the second round as compared to the fourth round. But this will not be possible if he scored only 10 points in the second round. Hence, this case is not possible.

If Match is the third round, Connect must be the fifth round. Quickfire cannot be the first or second rounds since he cannot score 60 points before the beginning of Quickfire round. Quickfire cannot be the fourth round because he could not have scored 10 points in Quickfire round (from (ii)). Hence, this case is not possible.

If Match is in the second round, Connect will be the fourth round. In the third and fourth rounds, he would have scored 10 points each. If Match is the second round, in the third round he scored 10 points. From (ii), Kiran's score in Quickfire round must be at least 30. Hence, Quickfire cannot be the third round. Hence, Quickfire must be the fifth round. Since his score before the beginning of Quickfire round is 60 and he already scored 10 points each in the third and fourth rounds, he must have score 10 and 30 points in the first and second rounds in any order. From (i), Kiran must have scored more than 10 points in the second round. Hence, he must have scored 30 points in the second round and 10 points in the first round. Wipeout cannot be the third round because he would have scored 50 points at the end of the third round and this will violate (ii). Hence, the first round is the Wipeout round. From (ii), Kiran's score in Quickfire round must be 30. This is the only possible case.

The following table presents the order of the rounds and the points scored by Kiran in each round:

Order	1	2	3	4	5
Round	Wipeout	Match	AV	Connect	Quickfire
Points	10	30	10	10	30

5. Kiran scored 40 points at the end of Match round. Choice (C)

6. Kiran scored 10 points in the third round. Choice (A)

7. Kiran scored 90 points in the quiz. Choice (A)
8. Kiran scored the maximum number of points in Match. Choice (B)

Solutions for questions 9 to 12:

From (iv), Hari's score in Maths is the sum of the scores in two other subjects and he scored equally in the two subjects. The only other case is S1, which can be expressed as the sum of two other pies, i.e., S2 and S3. In this case, S2 and S3 are equal (from (i)). Hence, S1 must be Mathematics.

From (ii), Hari scored more in Economics than in Chemistry. From (ii) and (vi), the marks of Hari in Zoology and Physics are less than that in Chemistry.

Chemistry cannot be represented by S6 since Economics must be represented by a pie whose value is higher than S6 and no such pies are present in the chart. Chemistry cannot be represented by S4 because it is the smallest pie in the chart. If Chemistry is represented by either of S2 or S3, then Zoology and Physics cannot be represented by pies which have a lower value than Chemistry. Hence, Chemistry must be represented by S5. Economics must be represented by S6.

Zoology can be represented by S2/S3 or by S4.

Let Zoology be represented by S2/S3.

If Hari scored $2x$ in Maths, his score in Zoology and one other subject must be x .

Hari's score in the subject represented by S4 must be $2x - 55$ (from (v)).

Let y be Hari's score in Economics represented by S6. Hari's score in Chemistry must be $y - 15$ (from (ii)). His score in Zoology must be $y - 45$ (from (vi)). His score in Maths must be $2y - 90$ (since he scored twice in Maths).

$$\text{Therefore, } 2y - 90 = 2x \Rightarrow y - x = 45$$

Hari's score in the subject represented by S4 will be $2y - 145$ (since $x = y - 45$).

The sum of the scores of Hari in the subjects represented by S4, S5 and S6 must be $4x$ (since the sum of scores represented by S1, S2 and S3, which form half the pie, is $4x$).

$$\text{Therefore, } y + y - 15 + 2y - 145 = 4x \Rightarrow 4y - 4x = 160 \\ \Rightarrow y - x = 40$$

The two equations above are contradictory. Hence, Zoology cannot be represented by S2/S3 and must be represented by S4. Botany and Physics must be represented by S2 and S3 in any order.

In this case, the marks scored in Zoology will be $y - 45$. In Maths, Hari would have scored $2x$ which must be the same as $y + 10$.

$$\text{Hence, } 2x = y + 10 \Rightarrow 2x - y = 10$$

The marks scored by Hari in Economics, Chemistry and Zoology will be y , $y - 15$, and $y - 45$ respectively. The sum of these three must be equal to $4x$.

$$\therefore 3y - 60 = 4x \Rightarrow -4x + 3y = 60$$

Solving the two equations we get, $y = 80$ and $x = 45$. Hence, the marks scored by Hari in Maths, Physics, Botany, Zoology, Chemistry and Economics are 90, 45, 45, 35, 65 and 80 respectively.

9. The total marks scored by Hari = $8x = 360$. Choice (B)

10. Hari scored 45 marks in Botany. Choice (A)

11. The pie representing Chemistry is definitely adjacent to the pie representing Zoology. Choice (C)
12. The angle subtended by the pie representing Chemistry = 65° Choice (C)

Solutions for questions 13 to 16:

The number of persons in the office at the end of each hour is given below:

Hour ending at	Number of Persons in Office
10:00 AM	15
11:00 AM	31
12:00 noon	48
1:00 PM	35
2:00 PM	84
3:00 PM	90
4:00 PM	45
5:00 PM	0

13. To find the maximum number of persons in the office at 1:47 PM, we can assume that all the persons who entered the office between 1:00 PM and 1:59 PM entered the office before 1:47 PM and all the persons who left the office during this time left after 1:47 PM. Hence, at 1:47 PM, the maximum number of persons in the office will be $35 + 61 = 96$. Ans: (96)
14. The maximum number of persons in the office between 9:00 AM and 9:59 AM is 15. The maximum number of persons in the office between 10:00 AM and 10:59 AM is 41 (assuming that during this time, everyone entered before anyone left). The maximum number of persons in the office between 11:00 AM and 11:59 AM is 67. The maximum number of persons in the office between 12:00 noon and 12:59 PM is 89. The maximum number of persons in the office between 1:00 PM and 1:59 PM is 96. The maximum number of persons in the office between 2:00 PM and 2:59 PM is 113. The maximum number of persons in the office between 3:00 PM and 3:59 PM is 97. The maximum number of persons in the office between 4:00 PM and 5:00 PM is 51. Hence, the maximum possible number of persons in the office at any time = 113. Ans: (113)
15. At 1:00 PM, the maximum number of persons that could have entered the office is 61. 35 persons were already in the office by this time. The 12 persons who exited the office between 1:00 PM and 2:00 PM could be from this 35, leaving a remainder of 23 persons. Between 2:00 PM and 3:00 PM, 29 persons entered and 23 persons exited. Let us assume that the 23 persons who exited were among the ones who entered during this period. Between 3:00 PM and 4:00 PM, 7 persons entered and 52 persons exited. Assume that of the 52 persons, who exited, 7 persons were the ones who entered during this hour. That leaves 45 persons. Apart from the 61 persons who entered at 1:00 PM, there are 29 persons in the office. Let these 29 persons exit the office during this period. This leaves another 16 persons. These 16 persons must be from the 61 who entered the office at 1:00 PM. This will leave 45 persons who entered the office at 1:00 PM. These 45 persons could have exited just before 5:00 PM. This is the maximum possible number of persons who could have entered at 1:00 PM and exited just before 5:00 PM. Ans: (45)
16. To spend 419 minutes, i.e., 6 hours 59 minutes, they must have entered at 9:00 AM and left at 3:59 PM OR they must have entered at 10:00 AM and left 4:59 PM. For the persons who entered the office at 9:00 AM to stay till 3:59 PM, we can check whether the number of persons who entered from 10:00 AM onwards is sufficient to

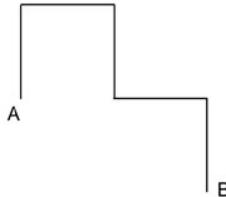
account for all the persons who left from 10:00 AM onwards. We can see that for each hour, the persons who left can be from the persons who entered after 10:00 AM. Hence, all the 15 persons who entered at 9:00 AM could have stayed till 4:00 PM.

The number of persons who entered at 10:00 AM is 26. We should perform a similar check as the one mentioned above. Further, since we are maximizing the number of persons who stayed for 419 minutes, we should also consider the 10 people who left at 10:59 AM. These 10 people can be among the ones who entered the office at 9:00 AM or among the ones who entered the office at 10:00 AM. Therefore, the number of persons who can stay in the office for 419 minutes will be $15 + 16 = 31$ persons.

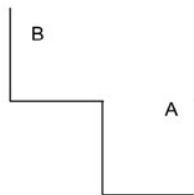
Ans: (31)

Solutions for questions 17 to 20:

From (i), a person took two right turns, a left turn and another right turn to reach Shadehollow from Moorhead. For the given turns, a person going North from A to B will have to follow a path as shown in the figure below but the distance between turns can vary:



Similarly, a person going South (from A to B) will have to take a path similar to the one shown below but the distance between turns can vary:



We can use this pattern to see whether this will connect any pair of cities. Let Moorhead be C1. From C1, a person can only go North. If he takes the first right, he will not be able to take the last right, as there will be no roads to take the last right. If he takes the second right, he will have to pass through C3, which is not possible. If he takes the third right, he will have to pass through C5, which is again not possible. He cannot take the fourth right because he will reach C6 before he can take the fourth right. Hence, C1 is not Moorhead.

Let C2 be Moorhead. If he is going North, he cannot take the path given above, since he cannot take the last right. Hence, he must be going South. From C2, he can reach C6 by taking the first right, and then the first right after that, and then the first left and then the first right. Hence, Moorhead and Shadehollow can be C2 and C6 respectively. From C2, no other city is accessible for the given route.

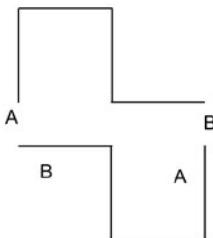
Let C3 be Moorhead. From C3, a person can reach C6 by travelling South. Hence, this is another possibility.

Let C4 be Moorhead. A person will not be able to follow this path by travelling North from C4.

Let C5 be Moorhead. A person can travel North and reach C2 using this route. But a person cannot travel South from C5 in this route. Hence, this is another possibility.

C6 cannot be Moorhead because there will be no roads to take a left after he takes two rights.

From (ii), for a person travelling North, the following route must be followed:



For a person travelling South, the following route must be followed:

Let C1 be Whitesilver. No other city can be reached using the route by travelling North. Hence, this is not possible.

Let C2 be Whitesilver. By travelling North, a person will not be able to take the last left. By travelling South, a person cannot reach any other city.

Let C3 be Whitesilver. Even in this case, no other city can be reached by travelling along this route.

Similarly, C4 also cannot be Whitesilver. Let C5 be Whitesilver. In this case, a person can reach C4 by travelling North. Hence, this is one possibility. C6 cannot be Whitesilver because there are no roads to travel along the given route. Hence, the only possibility is that C5 is Whitesilver and C4 is Violetwick.

From the possibilities for (i), C5 cannot be Moorhead. Hence, C2/C3 can be Moorhead. In either case, C6 is Shadehollow.

Since Violetwick is C4, a person can reach Southshore by taking three left turns and two right turns. Southshore can only be one among C1 or C2 or C3. By taking three left turns and two right turns, a person can only reach C3 from C4. Hence, C3 is Southshore. From the possibilities arrived at from (i), only one remains, i.e., C2 is Moorhead. Hence, C1 must be Icefay.

The following table provides the cities and their labels:

Label	City
C1	Icefay
C2	Moorhead
C3	Southshore
C4	Violetwick
C5	Whitesilver
C6	Shadehollow

17. Whitesilver is represented by C5. Choice (B)
18. Shadehollow is C6. By taking one left turn, a person can reach Whitesilver or Southshore. From the given options, a person cannot reach Moorhead. Choice (C)
19. To go from Moorhead (C2) to Shadehollow (C6), a person must take a minimum of three turns. Choice (D)
20. From Southshore (C3), a person can reach only Icefay (C1) by taking exactly one turn (since he can travel only along South). Hence, he can reach only 1 city. Ans: (1)

Solutions for questions 21 to 24:

On Day 1, B scored 24 points. His opponent must have scored 22 points and therefore, must be D.

C and E cannot play against each other, since they both scored 21 points. Hence, C and E could have played against A and F in any order.

On Day 2, A, B and C could not have played against each other. Hence, the three of them must have played against D, E and F in any order (but B and D already played against each other and cannot play against each other on Day 2).

On Day 3, B, C and F must have played against A, D and E (the player who played against D would have lost since D scored 23 points).

On Day 4, C, D and F must have played against A, B and E in any order.

On Day 5, D must have played against F (since they scored 22 and 24 points respectively). A and E must have played against B and C.

On Day 3, D would not have played against B or F (since D played against them on Day 1 and Day 5). Hence, D would have played against C on Day 3. D must play against A and E on the remaining days. D can play against E only on Day 4. Hence, D must have played against A on Day 2.

Now let us consider the matches that A played.

A can play against B on Day 3 or Day 5.

A can play against C on Day 1 or Day 3 or Day 5.

A played against D on Day 2.

A can play against E only on Day 1. Hence, C must have played against F on Day 1.

On Day 2, C cannot play against D or F (since he played against them on Day 1 and Day 3). Hence, C played against E on Day 2. Therefore, B played against F on Day 2.

On Day 5, C must have played against A (since he played against E on Day 2) and E must have played against B. On Day 4, C must have played against B, while F must have played against A. On Day 3, F must have played against E, and B must have played against A.

The following table provides the matches on each day (with the winner of each match highlighted in bold and with the scores in parenthesis):

Day 1	Day 2	Day 3	Day 4	Day 5
B – D (24-22)	A – D (21-17)	B – A (21-18)	C – B (21-17)	D – F (22-24)
C – F (21-14)	B – F (21-16)	C – D (21-23)	D – E (21-19)	A – C (21-23)
A – E (16-21)	C – E (21-16)	F – E (21-16)	F – A (21-19)	E – B (21-15)

- 21. D won the match against C. Choice (C)
- 22. B and C played against each other on Day 4. Choice (A)
- 23. F played against E on Day 3 and the total points scored by them are $21 + 16 = 37$. Choice (D)
- 24. F won all the matches that he played (against A and B) after he played against E (on Day 3). Choice (B)

Solutions for questions 25 to 28:

Let 1 to 6 represent the positions in which the six persons are standing from West to East.

Since each person is facing North and South alternately, the person at the Western most position can be facing either North or South. We can see that the person referred to in (ii) must be standing at one of the ends. If the person at the West end is facing North, the person at the East end must be facing South. In this case, the person facing South has 0 persons to the left of

him. Hence, this is not possible. Therefore, the person at the West end is facing South and the one at the East end is facing North.

From (i), B and C must be facing the same direction since they are standing two places away from each other. From (iv), E and F must be facing the same direction for the same reason. These two pairs of persons must be facing different directions because there are only three persons facing the same direction. The remaining two persons A and D cannot be facing the same direction because that will result in four persons facing the same direction. Hence, A and D are facing opposite directions.

From (iii), A and D can be at 2 and 1 OR at 4 and 3 OR at 6 and 5. The two of them cannot be standing at 4 and 3 because B cannot be standing two places to the left of C in this case. If they are standing at 6 and 5, B and C must be at 2 and 4 (since they are not at any end). In this case, E cannot be to the left of D. Hence, this is not possible.

Hence, A and D must be at 2 and 1. B and C will be at 5 and 3 respectively. From (iv), E will be at 4 and F will be at 6.

The following table provides the order in which they are standing and the directions that they are facing:

Order	1	2	3	4	5	6
Person	D	A	C	E	B	F
Facing	South	North	South	North	South	North

- 25. No one is standing to the right of D. Choice (C)
- 26. B is standing adjacent to E. Choice (B)
- 27. Four persons are standing to the right of A. Choice (A)
- 28. Three persons are standing to the left of E. This is the same as the number of persons standing to the left of C. Choice (A)

Solutions for questions 29 to 32:

From (i), Pavan watched the 125-minute movie and he came out after 1:20 PM. He could not have watched the 11:00 AM show.

From (ii), Farhan was the last person to come out of the theatre and from (iv), Manish must be the fourth person to come out of the theatre.

Lokesh came out after 2:45 PM. Since he did not watch the 205-minute movie, the movie that he watched could have started at 12:15 PM and the duration can be 160 or 180 minutes OR it could have started at 11:50 AM and the duration can be 180 minutes. The earliest that Lokesh can be out of the multiplex is 2:50 PM.

Farhan and Manish could not have watched the 11:00 AM show as the person who watched this show would have been out of the multiplex by at most 2:25 PM. They also could not have watched the 11:25 AM show as they would have been out by 2:50 PM. In either case, they cannot be the fourth and fifth persons to come out of the multiplex.

Since, except for Salman, none of the others could have watched the 11:00 AM show, Salman must have watched the 11:00 AM show. Also, apart from Pavan (and Salman), none of the others could have watched the 11:25 AM show. Hence, Pavan must have watched the 11:25 AM show.

If Lokesh watched the 12:15 PM show for 180 minutes, he would have been out of the multiplex by 3:15 PM. Farhan and Manish must have watched the 11:45 AM and 11:50 AM shows for 205 minutes and 160 minutes, in any order. The person who watched the 160-minute show would have come out by at most 2:30 PM. Either of Farhan or Manish can be this person because they came out after Lokesh. Hence, this case is not possible.

If Lokesh watched the 12:15 PM show for 160 minutes, he would have been out by 2:55 PM. Farhan and Manish must have watched the 11:45 AM and 11:50 AM shows for 180 minutes and 205 minutes, in any order. The person who watched the 180-minute show would have come out by at most 2:50 PM. This case is also not possible because one of Manish and Farhan would have come out of the multiplex before Lokesh.

If Lokesh watched the 11:50 AM show for 180 minutes, he would be out by 2:50 PM. Farhan and Manish must have watched the 11:45 AM and 12:15 PM shows for 160 minutes and 205 minutes, in any order. The person who watched the 160-minute movie must have been to the 12:15 PM for him to come out after Lokesh. This person would have come out by 2:55 PM. The person who watched the 205-minute movie at 11:45 AM would have come out by 3:10 PM. Hence, the former must be Manish and the latter must be Farhan.

The following table presents, for each person, the duration of the movie that he watched and the time at which the show began and ended:

Person	Duration	Start Time	End Time
Salman	100	11:00 AM	12:40 PM
Pavan	125	11:25 AM	1:30 PM
Lokesh	180	11:50 AM	2:50 PM
Manish	160	12:15 PM	2:55 PM
Farhan	205	11:45 AM	3:10 PM

29. Manish watched the 160-minute-long movie.
Choice (B)
30. Four persons started watching a movie before Manish did.
Ans: (4)
31. Lokesh came out of the multiplex at 2:50 PM.
Choice (A)
32. The duration of the movie that began at 11:45 AM was 205 minutes.
Ans: (205)

Difficulty level wise summary - Section II	
Level of Difficulty	Questions
Very Easy	-
Easy	13
Medium	1, 3, 5, 6, 7, 8, 14, 17, 18, 19, 20, 25, 26, 27, 28, 29, 30, 31, 32
Difficult	2, 4, 9, 10, 11, 12, 15, 16, 21, 22, 23, 24
Very Difficult	-

SECTION – III

Solutions for questions 1 to 34:

1. The given expression is equivalent to
 $\log_{10}a \log_{10}b + \log_{10}a \log_{10}c + \log_{10}b \log_{10}c = 425$
 $[\because \log_{10}ab = \log_{10}a + \log_{10}b]$
- Again, $abc = 10^{65}$
Taking logarithms to the base 10 on both sides, we get
 $\log_{10}a + \log_{10}b + \log_{10}c = \log_{10}10^{65} = 65$
- Let $\log_{10}a = x$, $\log_{10}b = y$ and $\log_{10}c = z$
 $\therefore (x + y + z) = 75$ and $xy + yz + xy = 425$
Now, $(x + y + z)^2 = x^2 + y^2 + z^2 + 2(xy + yz + xz)$
 $65^2 = x^2 + y^2 + z^2 + 2(425)$
 $\therefore x^2 + y^2 + z^2 = 3375 = 15^3$
- $\left[x^2 + y^2 + z^2 \right]^{\frac{1}{3}} = \left[15^3 \right]^{\frac{1}{3}} = 15.$ Choice (B)

2. Let the number of brothers and sisters in Imran's family be denoted by b and s respectively
Number of brothers of Imran = $b - 1$
It is given that Imran has an equal number of brothers and sisters
 $\therefore b - 1 = s \Rightarrow b = s + 1$
Again, each sister of Imran has twice as many brothers as sisters
 $\Rightarrow b = 2(s - 1)$
 $\therefore s + 1 = 2s - 2$
 $\Rightarrow s = 3$
 $\therefore b = s + 1 = 4$
Therefore, Imran has $(3 + 4 - 1)$, i.e., 6 siblings.
Choice (C)

3. Let the cost price of the item be x
Therefore, the selling price of the item
 $= x + \frac{25x}{100} = 800$ (given, 25% profit is made)
 $\Rightarrow \frac{5}{4}x = 800$
 $\therefore x = 640$
Thus, the cost price of the item is ₹640. Choice (B)
4. Let the number be denoted by N and let the number of digits in N be n and let them be denoted by $a_n, a_{n-1}, a_{n-2} \dots, a_2, a_1$ respectively.
 $N = a_n a_{n-1} a_{n-2} \dots a_2 a_1$
 $N = [a_n \times 10^{(n-1)}] + (a_{n-1} a_{n-2} \dots a_2 a_1)$
 $N = 10^{(n-1)} a_n + M$ (say)
It is given that, $M = \frac{1}{13}N$
 $\therefore 13M = 10^{(n-1)} a_n + M$
 $\Rightarrow 10^{(n-1)} a_n = 12M$
Now, let $n = 2$, i.e., $10a_2 = 12a_1$
 $\Rightarrow 5a_2 = 6a_1$
 $\Rightarrow a_1 = 6$ and $a_2 = 5$
i.e., $N = 65$, which is the least such positive integer.

Alternative Solution:

Let us assume that the least such number is a two-digit number xy .
It is given that $13y = 10x + y \Rightarrow 6y = 5x$, and $x = 6$ and $y = 5$ are the only possible values that satisfy ($\because x, y \leq 9$).
Hence, 65 is the least such number. Ans: (65)

5. In any geometric progression, the sum of the first n terms, the sum of the next n terms, and so on also follow a geometric progression (with a common ratio of r^n).

Now, given sum of first 2017 terms = 400, sum of next 2017 terms = $700 - 400 = 300$ [\because Sum of first 4034 terms = 700]
 \Rightarrow sum of next (i.e., the 3rd set of) 2017 terms

$$= 300 \times \left(\frac{300}{400} \right) = 225 \text{ (i.e., } ar^2 = (ar)r\text{)}$$

Hence, required sum to 6051 terms = $400 + 300 + 225 = 925$.

Alternative Solution:

It is given that $a + ar + ar^2 + \dots + ar^{2016} = 400$
Also, $a + ar + ar^2 + \dots + ar^{2016} + ar^{2017} + ar^{2018} + \dots + ar^{4033} = 700$
 $\Rightarrow 400 + ar^{2017} + ar^{2018} + \dots + ar^{4033} = 700$
 $\therefore ar^{2017} + ar^{2018} + \dots + ar^{4033} = 300$
 $r^{2017} (a + ar + \dots + ar^{2016}) = 300$
 $r^{2017} (400) = 300$
 $\Rightarrow r^{2017} = \frac{3}{4}$
Now $(a + ar + ar^2 + \dots + ar^{2016}) + (ar^{2017} + \dots + ar^{4033}) + (ar^{4034} + \dots + ar^{6050})$

$$= 400 + 300 + r^{2017} (ar^{2017} + ar^{2018} + \dots + ar^{4033}) \\ = 700 + \frac{3}{4} (300) = 925. \quad \text{Ans: (925)}$$

6. The probability of getting four heads and two tails when the coin is flipped six times = ${}^6C_4 P^4(1-p)^2$

Similarly, the probability of getting two heads and four tails = ${}^6C_2 p^2 (1-p)^4$

$$\text{It is given that } {}^6C_4 p^4(1-p)^2 = 4[{}^6C_2 p^2 (1-p)^4] \\ \Rightarrow p^2 = 4(1-p)^2 \\ \Rightarrow p = 2(1-p)$$

$$\therefore p = \frac{2}{3}$$

Therefore, the probability of getting two heads and two tails when the coin is flipped four times = ${}^4C_2 (p)^2 (1-p)^2$

$$= 6 \left(\frac{2}{3}\right)^2 \left(\frac{1}{3}\right)^2 = \frac{8}{27}. \quad \text{Choice (A)}$$

7. We tabulate the values of the four functions, 0.3^x , 0.2^x , 3^x and 2^x , for $x = -1, 0, 1$, in the following table:

	x		
y = f(x)	-1	0	1
$y = 0.3^x$	3.33	1	0.3
$y = 0.2^x$	5	1	0.2
$y = 3^x$	0.33	1	3
$y = 2^x$	0.5	1	2

Now, by observation:

- I represents 0.3^x (i.e., the lower graph among I and II in Q2)
II represents 0.2^x
III represents 3^x (i.e., the higher graph among III and IV in Q1)
IV represents 2^x . Choice (B)

8. P will end up with more marks than Q, if in the remaining 6 questions P correctly answers an equal or more number of questions than Q. We have the following cases in which this can happen:

Case 1: Q answers 0 questions correctly and P answers 0/1/2/3/4/5/6 questions correctly

$$\therefore \text{Number of ways} = {}^6C_0 ({}^6C_0 + {}^6C_1 + {}^6C_2 + {}^6C_3 + {}^6C_4 + {}^6C_5 + {}^6C_6) = 64$$

Case 2: Q answers 1 question correctly and P answers 1/2/3/4/5/6 questions correctly

$$\therefore \text{Number of ways} = {}^6C_1 ({}^6C_1 + {}^6C_2 + {}^6C_3 + {}^6C_4 + {}^6C_5 + {}^6C_6) = 378$$

Case 3: Q answers 2 questions correctly and P answers 2/3/4/5/6 questions correctly

$$\therefore \text{Number of ways} = {}^6C_2 ({}^6C_2 + {}^6C_3 + {}^6C_4 + {}^6C_5 + {}^6C_6) = 855$$

Case 4: Q answers 3 questions correctly and P answers 3/4/5/6 questions correctly

$$\therefore \text{Number of ways} = {}^6C_3 ({}^6C_3 + {}^6C_4 + {}^6C_5 + {}^6C_6) = 840$$

Case 5: Q answers 4 questions correctly and P answers 4/5/6 questions correctly

$$\therefore \text{Number of ways} = {}^6C_4 ({}^6C_4 + {}^6C_5 + {}^6C_6) = 330$$

Case 6: Q answers 5 questions correctly and P answers 5/6 questions correctly

$$\therefore \text{Number of ways} = {}^6C_5 ({}^6C_5 + {}^6C_6) = 42$$

Case 7: Q answers 6 questions correctly and P answers 6 questions correctly

$$\therefore \text{Number of ways} = {}^6C_6 \times {}^6C_6 = 1$$

Therefore, the total number of ways
= $64 + 378 + 855 + 840 + 330 + 42 + 1 = 2510$

Alternative solution:

P will end up with more marks than Q, if of the remaining six questions, P answers an equal or more number of questions correctly than Q. The number of ways in which P answers more questions correctly than Q will be equal to that in which Q answers more questions correctly than P.

The number of ways in which P and Q answer an equal number of questions correctly

$$= ({}^6C_0 \times {}^6C_0) + ({}^6C_1 \times {}^6C_1) + ({}^6C_2 \times {}^6C_2) + ({}^6C_3 \times {}^6C_3) + ({}^6C_4 \times {}^6C_4) + ({}^6C_5 \times {}^6C_5) + ({}^6C_6 \times {}^6C_6) \\ = 924$$

The number of ways in which, of the remaining 6 questions, P answers more number of questions correctly than Q

$$= \frac{(2^6)(2^6) - 924}{2} = 1586 \text{ ways}$$

[∴ The total number of outcomes for P and Q among the remaining questions = $2^6 \times 2^6$]

Therefore, the number of ways required = 1586 + 924
= 2510 ways. Ans: (2510)

9. Let the total length of the wall be 60 units

Output per day of A and B will be 3 units and 2 units respectively

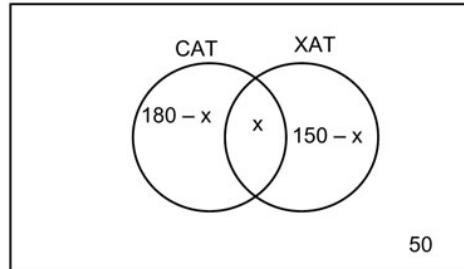
Therefore, A and B together can complete

$3 + 2 = 5$ units per day

Hence, time taken to complete two such walls

$$= \frac{2 \times 60}{(2+3)} = 24 \text{ days.} \quad \text{Choice (D)}$$

10. The minimum number of students taking both the exams will occur when we consider maximum number of students taking at least one of the exams. We can represent this in a venn diagram as follows



Now $(180 - x) + (x) + (150 - x) + 50 = 300$

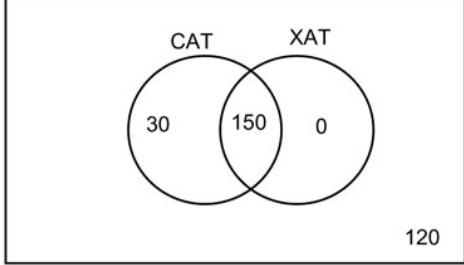
$$380 - x = 300$$

$$\Rightarrow x = 80$$

$$\therefore N = 80$$

The maximum number of students taking both the exams occurs when all those who take XAT also take CAT. We can represent this in a Venn diagram as follows

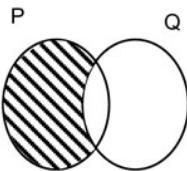
Therefore the value of M = 150



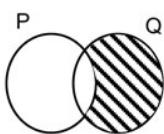
Thus, $M + N = 150 + 80 = 230$.

Ans: (230)

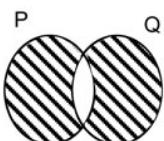
11. (i) $P - Q$ is represented as



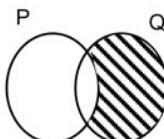
$Q - P$ is represented as



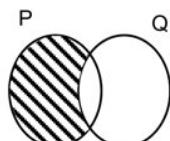
$\therefore (P - Q) \cup (Q - P)$ will be



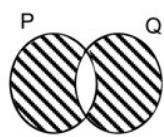
- (ii) $(P' \cap Q)$ is represented as



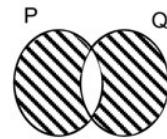
$(Q' \cap P)$ is represented as



$\therefore (P' \cap Q) \cup (Q' \cap P)$ will be



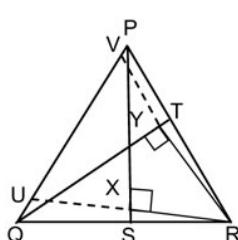
- (iii) In the same way $(P \cup Q) - (P \cap Q)$ will be



Thus, all three choices satisfy.

Choice (A)

- 12.



As shown in the figure above, we extend RX and RY such that they interest side PQ at U and V respectively.

Since PX is the bisector of angle P and PX is perpendicular to RX, triangle PUR is an isosceles triangle and X is the midpoint of RU [In an isosceles triangle the bisector of the angle included by the equal sides is the perpendicular bisector of the base]

$$\therefore PR = PU = 62$$

Similarly, since QY is the bisector of angle Q and QY is perpendicular to RY, triangle QRV is an isosceles triangle, and Y is the midpoint of RV

$$\therefore QR = QV = 59$$

Now, consider triangle RUV

X is the midpoint of RU and Y is the midpoint of RV

$$\therefore XY = \frac{1}{2}(UV)$$

$$\text{and } UV = PU + QV - PQ = 62 + 59 - 67 = 54$$

$$\therefore XY = \frac{1}{2}(54) = 27. \quad \text{Choice (A)}$$

13. The decrease in total weight = $20 \times 0.25 = 5$ kg
Hence, the new boy should have been 5 kg lighter than the boy whom he replaced.

Therefore, the new boy would weigh $48 - 5 = 43$ kg.
Choice (A)

14. Let the work done per day in units by a man and a woman be denoted by M and W respectively

$$\begin{aligned} \text{Now, } (8M + 3W)8 &= (12M + aW)6 = (aM + 9W)10 \\ \text{We consider } (8M + 3W)8 &= (12M + aW)6 \\ \Rightarrow 4(8M + 3W) &= 3(12M + aW) \\ \Rightarrow 12W - 3aW &= 36M - 32M \\ \Rightarrow 12W - 3aW &= 4M \\ \therefore \frac{M}{W} &= \frac{12 - 3a}{4} \quad \text{----- (i)} \end{aligned}$$

$$\begin{aligned} \text{Similarly considering } (8M + 3W)8 &= (aM + 9W)10 \\ \Rightarrow 4(8m + 3W) &= 5(aM + 9W) \\ \Rightarrow 32M + 12W &= 5aM + 45W \\ \Rightarrow 32M - 5aM &= 33W \\ \therefore \frac{M}{W} &= \frac{33}{32 - 5a} \quad \text{----- (ii)} \end{aligned}$$

$$\begin{aligned} \text{Now, } \frac{12 - 3a}{4} &= \frac{33}{32 - 5a} \quad (\text{from (i) and (ii)}) \\ \Rightarrow (4 - a)(32 - 5a) &= 44 \\ \Rightarrow 5a^2 - 52a + 84 &= 0 \\ \Rightarrow 5a^2 - 10a - 42a + 84 &= 0 \\ \Rightarrow (a - 2)(5a - 42) &= 0 \\ \text{Since } a \neq \frac{42}{5}, 80a &= 2. \end{aligned}$$

Alternative Solution:

We can substitute for a from the choices and check for the ratio of a man's efficiency to that of a woman in each case.

For example, if $a = 5$ (as given in choice A), we get

$$(8m + 3w)8 = (12m + 5w)6, \text{ which gives } \frac{m}{w} \text{ as negative.}$$

If $a = 4$ (Choice B), we get $(8m + 3w)8 = (12m + 4w)6$, which gives $\frac{m}{w} = 0$, which is not possible.

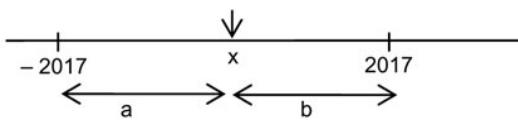
If $a = 3$ (Choice C), we get $(8m + 3w)8 = (12m + 3w)6$, which gives $\frac{m}{w} = \frac{1}{2}$ and $(8m + 3w)8 = (3m + 9w)10$, which gives $\frac{m}{w} = \frac{33}{12}$. Hence this case is not possible.

Hence, by elimination, choice (D). Choice (D)

15. Let us denote the length and the breadth of the rectangle by l and b respectively
 Area of the rectangle = lb
 New area of the rectangle = $(1.25 l)(0.75)b = 0.9375 lb$
 Therefore, the percentage reduction in the area of the rectangle = $\frac{lb - 0.9375lb}{lb} \times 100 = 6.25\%$.

Choice (A)

16. We know that $|x - a|$ is the distance of x from a on the number line, whereas $|x + a|$ is the distance of x from $-a$ on the number line.
 If we take x to the left of 2017, then $|x + 2017| - |x - 2017| = -4034$
 Again, if we take x to the right of 2017, then $|x + 2017| - |x - 2017| = 4034$
 $\therefore x$ must lie between -2017 and 2017.

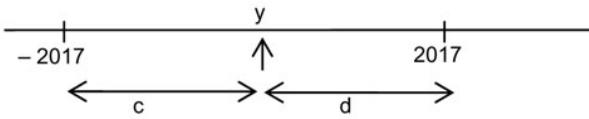


Now, $|x + 2017| = a$ and $|x - 2017| = b$
 We are given that $a + b = 4034$ and $a - b = 2$

Solving, we get $a = 2018$ and $b = 2016$

$$\therefore x = -2017 + 2018 = 1$$

Similarly, $|y - 2017| - |y + 2017| = 2$, when y lies between -2017 and 2017



$|y - 2017| = d$ and $|y + 2017| = c$
 It is given that $d - c = 2$ and $d + c = 4034$

Solving, we get $d = 2018$ and $c = 2016$

$$\therefore y = -2017 + c = -2017 + 2016 = -1$$

Therefore, the value of $(x - y) = (1 - (-1)) = 2$.

Alternative Solution:

Interpreting the modulus sign $|x - a|$ as the distance of x from a on the number line, we get the conditions for x and y as follows:

x is two units farther from -2017, as it is from 2017, i.e., achieved by moving x rightwards by 1 unit, towards 2017, from the midpoint $x = 0$. This gives $x = 1$.

y is two units farther from 2017, as it is from -2017, i.e., achieved by moving y leftwards by 1 unit towards -2017, from the mid point $y = 0$. This gives $y = -1$.

Hence, $x = 1$ and $y = -1$, i.e., $x - y = 2$. Choice (B)

17. The total simple interest on ₹60000 at 7.5% rate of interest in n years is given by $\frac{60000 \times 7.5 \times n}{100}$

$$\text{Now, } \frac{60000 \times 7.5 \times n}{100} = 36000$$

$$\Rightarrow n = 8. \quad \text{Choice (D)}$$

18. It is given that $a^3b^2 = 1458$
 The minimum value of $(4a + 3b)$ will occur

$$\text{When } \frac{4a}{3} = \frac{3b}{2}$$

$$\Rightarrow a = \frac{9}{8}b$$

$$\therefore a^3b^2 = \frac{9^3}{8^3} b^5 = 1458$$

$$\Rightarrow b^5 = 2^{10}$$

$$\therefore b = 4 \text{ and } a = \frac{9}{2}$$

Therefore, the minimum value of $4a + 3b$

$$= 4 \frac{(9)}{2} + 3(4) = 30.$$

Alternative Solution:

$a^3.b^2 = 1458$ can be written as

$$\left(\frac{4a}{3}\right)\left(\frac{4a}{3}\right)\left(\frac{4a}{3}\right)\left(\frac{3b}{2}\right)\left(\frac{3b}{2}\right) = \left(\frac{4}{3}\right)^3 \times \left(\frac{3}{2}\right)^2 \times 1458,$$

such that the sum of all the five terms on the LHS is $(4a + 3b)$ and this sum will be minimum when all the five terms on the LHS are equal, to say k each.

$$\Rightarrow k^5 = (2^5)(3^5), \text{ i.e., } k = 6$$

$$\Rightarrow a = k \cdot \frac{3}{4} = \frac{9}{2}$$

$$\text{and } b = k \frac{2}{3} = 4$$

$$\Rightarrow 4a + 3b = 30.$$

Ans: (30)

19. $(7 \oplus (t \oplus 2)) = 2$

$$\Rightarrow \left(7 \oplus \frac{t+2}{t-2}\right) = 2$$

$$\Rightarrow \frac{7+t+2}{t-2} = 2$$

$$\Rightarrow \frac{7t-14t+t+2}{7t-14-t-2} = 2$$

$$\Rightarrow \frac{8t-12}{6t-16} = 2$$

$$\Rightarrow 8t-12 = 12t-32$$

$$\Rightarrow 4t = 20$$

$$\therefore t = 5.$$

Choice (C)

20. If $4x + 5y + 2z = 111$, then y must be odd.

Let $y = 2k - 1$, where k is a positive integer.

$$\therefore 4x + 5(2k - 1) + 2z = 111$$

$$\Rightarrow 4x + 10k + 2z = 116$$

$$\Rightarrow 2x + 5k + z = 58 \quad \text{----- (1)}$$

For every pair of (x, k) such that $2x + 5k < 58$, there will be a unique value of z such that the equation (1) is satisfied.

Thus, we need to simply need to count the number of pairs of (x, k)

Now, for a fixed value of k , x can be at the most

$$\left[\frac{57 - 5k}{2} \right], \text{ where } [x] \text{ is the greatest integer less than or}$$

equal to x .

Now, k can take values from 1 to 11.

When $k = 1$, we have x taking a maximum value of

$$\left[\frac{57 - 5}{2} \right] = 26. \text{ Therefore, } x \text{ can take values from 1 on}$$

wards till 26, which gives a total of 26 solutions, which can be tabulated as follows

k	1	1	1	1	1
x	1	2	3	4	26
z	51	49	47	45	1

Proceeding in this manner, the number of solutions is given

$$\text{by } \sum_{k=1}^{11} \left[\frac{57 - 5k}{2} \right] = 26 + 23 + 21 + 18 + \dots + 6 + 3 + 1$$

Now, the sum of the series $(26 + 23) + (21 + 18) + \dots + (6 + 3) + 1 = 49 + 39 + 29 + 19 + 9 + 1$
 $= \frac{5}{2} [49 + 9] + 1 = 146$

Alternative solution:

$$4x + 5y + 2z = 111$$

As 111 is odd, $4x + 5y + 2z$ must also be odd, which implies y is odd.

Let $y = 2k - 1$, which gives $4x + 5(2k - 1) + 2z = 111$

$$\Rightarrow 4x + 10k + 2z = 111$$

$$\Rightarrow 2x + 5k + z = 55$$

Now, for $k = 1, 2, \dots, 11$, we get the equation $2x + z = 53$, $2x + z = 48$, $2x + z = 43$, and so on till $2x + z = 3$.

In $2x + z = 53$, x can take values from 1 to 26, giving us 26 solutions.

In $2x + z = 48$, x can take values from 1 to 23, giving us 23 solutions.

In $2x + z = 43$, x can take values from 1 to 21, giving us 21 solutions.

Proceeding similarly, for $2x + z = 8$, x can take values from 1 to 3, giving us 3 solutions.

For $2x + z = 3$, x can take only one value, i.e., 1, giving us only one solution.

Therefore, the total number of solutions

$$\begin{aligned} &= (26 + 23) + (21 + 18) + \dots + (6 + 3) + 1 \\ &= 49 + 39 + 29 + 19 + 9 + 1 \\ &= 146 \end{aligned}$$

Therefore, $4x + 5y + 2z = 111$ has 146 solutions, such that x , y and z are positive integers. Choice (D)

21. It is given that, $\sqrt[3]{x} = \frac{6}{5 - \sqrt[3]{x}}$

$$\text{Let } \sqrt[3]{x} = t$$

$$\therefore t = \frac{6}{5-t}$$

$$\Rightarrow 5t - t^2 = 6$$

$$\Rightarrow t^2 - 5t + 6 = 0$$

$$\Rightarrow (t-3)(t-2) = 0$$

$$\therefore t = 3 \text{ or } t = 2$$

$$\text{Therefore, } \sqrt[3]{x} = 3 \text{ or } \sqrt[3]{x} = 2$$

$$\Rightarrow x = 27, \text{ or } x = 8$$

Thus, the sum of all the possible values of x = $8 + 27 = 35$. Choice (A)

22. Let $x^2 + ax + b$ and $x^2 + cx + d$ be the two quadratic expressions where a, b, c, d, e integers.

$$\text{Now, } (x^2 + ax + b)(x^2 + cx + d) = x^4 + (a+c)x^3 + (b+d+ac)x^2 + (ad+bc)x + bd$$

Equating the coefficients of the above expression with $x^4 - tx^2 + 48$, we get $a+c = 0$, $b+d+ac = 0$ and $bd = 48$
 $\Rightarrow a = -c$ and $b+d = a^2$ [i.e., a perfect square]

Now, 48 can be expressed as a product of two numbers as follows:

1×48 , 2×24 , 3×16 , 4×12 and 6×8 . Of these, only 1×48 and 4×12 are acceptable, as only $(1 + 48) = 49$ and $(4 + 12) = 16$ are perfect squares. [$\because b + d = a$ a perfect square]

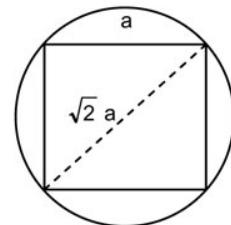
We need to find the smallest positive value of t , i.e., $(ad + bc)$

We tabulate the values of b , d , a , c and $(ad + bc)$ as follows:

b	d	a	c	$ad + bc$
1	48	± 7	∓ 7	± 329
48	1	± 7	∓ 7	± 329
4	12	± 4	∓ 4	± 32
12	4	± 4	∓ 4	± 32

Therefore, the smallest positive value of t is 32. Ans: (32)

23. Let the side of the square be a
 Therefore the area of the square = $a^2 = 392$
 $\Rightarrow a = 14\sqrt{2}$



The diagonal of the square = Diameter of the circle

$$\begin{aligned} \Rightarrow a\sqrt{2} &= 2r \\ (14\sqrt{2})\sqrt{2} &= 2r \\ \Rightarrow r &= 14 \text{ cm} \end{aligned}$$

Therefore, the radius of the circle is 14 cm. Choice (A)

24. Let us denote the speeds of the buses starting from Asansol and Kolkata by v_a and v_k respectively (in km per min)
 Let the two buses cross each other at M
 $AM = v_a (180)$
 $KM = v_k (125)$

Let the time taken (in minutes) by the two buses to reach their destinations from M be t
 $MA = v_k t$
 $MK = v_a t$

$$\begin{aligned} \text{Now } (AM)(KM) &= v_a 180 \times v_k 125 = v_k \times v_a t \\ \Rightarrow t^2 &= 180 \times 125 \\ \Rightarrow t &= \sqrt{180 \times 125} = 5 \times 6 \times 5 = 150 \end{aligned}$$

Therefore, the two buses will reach their respective destinations 150 minutes after 11 am, i.e., at 1:30 pm. Choice (C)

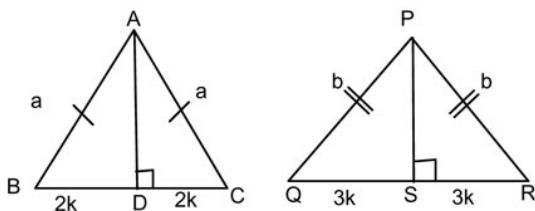
25. It is given that
 $f(x) = f(f(x+4))$, if $x < 100$ and $f(x) = x - 2$, if $x \geq 100$.

We start by taking values of x closest to 100, so that we get iterations of the function

$$\begin{aligned} f(99) &= f(f(103)) = f(101) = 99 \\ f(98) &= f(f(102)) = f(100) = 98 \\ f(97) &= f(f(101)) = f(99) = 99 \\ f(96) &= f(f(100)) = f(98) = 98 \end{aligned}$$

Proceeding similarly, we observe that for $x < 100$
 $f(\text{odd}) = 99$ and $f(\text{even}) = 98$
 $\therefore f(50) = 98$. Choice (D)

26. Let us denote the sides of equal lengths of the two triangles as a and b respectively and let their bases be $4k$ and $6k$ respectively.
 Therefore, we get the following triangles:



We drop two perpendiculars AD and PS to the respective bases which bisects the bases [$\triangle ABC$ and $\triangle PQR$ are isosceles]

As the two triangles have equal perimeters,
 $2a + 4k = 2b + 6k$
 $\Rightarrow k = a - b$

$$\text{Again, area of } \triangle ABC = \frac{1}{2} (4k) (AD)$$

$$= \frac{1}{2} (4k) \left(\sqrt{a^2 - 4k^2} \right)$$

$$\text{Area of } \triangle PQR = \frac{1}{2} (6k) (PS)$$

$$= \frac{1}{2} (6k) \left(\sqrt{b^2 - 9k^2} \right)$$

As the two triangles have equal area

$$\frac{1}{2} (4k) \sqrt{(a-2k)(a+2k)} = \frac{1}{2} (6k) \sqrt{(b-3k)(b+3k)}$$

$$4\sqrt{a-2k} = 6\sqrt{b-3k} \quad \left[\because k\sqrt{(a+2k)} = k\sqrt{(b+3k)} \right]$$

Squaring both sides, we get

$$4(a-2k) = 9(b-3k)$$

$$4a + 19k = ab$$

$$\Rightarrow 4a + 19(a-b) = 9b$$

$$23a = 28b$$

$$\therefore \frac{a}{b} = \frac{28}{23}$$

Therefore, the minimum possible values of a and b are 28 and 23 respectively.

\therefore The perimeter of $\triangle ABC = 2a + 4k$

$$= 2a + 4(a-b)$$

$$= 6a - 4b$$

$$= 6(28) - 4(23)$$

$$= 76 \text{ units.}$$

Choice (C)

27. We need to find the sum of the logarithms (to the base 10) of all the factors of 10^{100} .

Now, $10^{100} = 2^{100} \times 5^{100}$ and in the list of all the factors of 10^{100} , each possible power of 2 (starting from 2^0 to 2^{100}) will pair up with each possible power of 5 (from 5^0 to 5^{100}), i.e., each possible power of 2 and 5 will appear exactly 101 times.

Now $\log_{10}(2^a \times 5^b) = \log_{10}(2^a) + \log_{10}(5^b)$.

Hence, required sum will simply become $101 \times [\log_{10}(2^0) + \log_{10}(2^1) + \log_{10}(2^2) \dots \dots \log_{10}(2^{100})] + 101 \times [\log_{10}(5^0) + \log_{10}(5^1) + \log_{10}(5^2) \dots \log_{10}(5^{100})]$

$$= 101 \times [\log_{10}(10^0) + \log_{10}(10^1) + \log_{10}(10^2) + \dots \log_{10}(10^{100})]$$

$$= 101 \times [0 + 1 + 2 + \dots + 100] = 101 \times \frac{(100+0)}{2} \times 101$$

$$= 101 \times 50 \times 101 = 510050.$$

Ans: (510050)

28. We know that, $2 \cos 6x \cos x = \cos 7x + \cos 5x$
 $[\because \cos(A+B) + \cos(A-B) = 2 \cos A \cos B]$

Let $m = \cos 7x$ and $n = \cos 5x$

We, have $m^3 + n^3 = (m+n)^3$

$$\Rightarrow mn(m+n) = 0$$

$$\Rightarrow \cos 7x \cos 5x (\cos 7x + \cos 5x) = 0$$

$$\Rightarrow 2 \cos 7x \cos 5x \cos 6x \cos x = 0$$

So, the possible values of x are for $\cos x = 0$, $\cos 5x = 0$, $\cos 6x = 0$ or $\cos 7x = 0$

Now, $\cos 90^\circ = \cos 270^\circ = \cos 450^\circ = \cos 630^\circ = 0$

Therefore the possible values of x in the given range are 45, 54, 75 and 90, whose sum is 264 degrees.

Ans: (264)

29. To minimize the value of N , we need to ensure that there are sufficient number of mangoes at each stage of sharing, so that no mango needs to be cut.

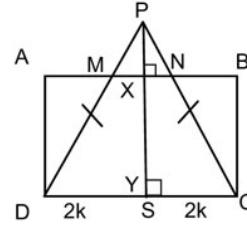
Hence, immediately after C took half the mangoes and before A, B and C share the remaining in the ratio of 3 : 2 : 1, we would need a minimum of $3 + 2 + 1 = 6$ mangoes. This implies that there were $6 + 6 = 12$ mangoes immediately after B took one-third of the mangoes. Hence, there must have been $12 \times \frac{3}{2} = 18$ mangoes immediately after A took one-fourth of the initial number of mangoes.

This implies that there must have been $18 \times \frac{4}{3} = 24$ mangoes initially.

Hence, the minimum possible value of N is 24.

Ans: (24)

30. The maximum possible area of an isosceles triangle which lies entirely within the square of side 24 cm = $\frac{1}{2}(24)(24) = 288$ sq. cm Hence, P must above AB (i.e., P cannot lie inside the square, because it is given that the area common to the square and the triangle is 360 sq.cm., which is greater than 288 sq.cm).



Let PC and PD intersect AB at N and M respectively as shown in the figure above.

$$\text{Area of the trapezium MNCD} = \frac{1}{2} (MN + CD) (BC) = 360$$

$$= \frac{1}{2} (24 + MN) 24 = 360$$

$$\Rightarrow MN = 6$$

Let us drop a perpendicular from P to CD such that it intersects AB at X and CD at Y

$$\text{Now, } \frac{PY}{PY} = \frac{MN}{CD} \quad [\text{Basic proportionality theorem}]$$

$$\frac{PY}{PY+24} = \frac{6}{24}$$

$$\Rightarrow PY = 8$$

$$\therefore \text{Area of } \triangle PCD = \frac{1}{2} (CD) (PY) = \frac{1}{2} (24) (8) = 96$$

$$= 384 \text{ sq units.}$$

Ans: (384)

31. Number of ways in which five balls can be selected from the bag = ${}^nC_5 = \frac{n(n-1)(n-2)(n-3)(n-4)}{5 \times 4 \times 3 \times 2 \times 1}$

Number of ways in which two balls can be selected from the bag = ${}^nC_2 = \frac{n(n-1)}{2 \times 1}$

It is given that ${}^nC_5 = 2({}^nC_2)$

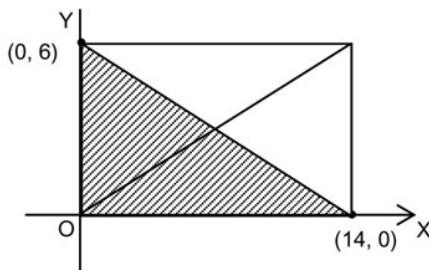
$$\Rightarrow \frac{n(n-1)(n-2)(n-3)(n-4)}{5 \times 4 \times 3 \times 2 \times 1} = \left[\frac{n(n-1)}{2 \times 1} \right] \times 2$$

$$\Rightarrow (n-2)(n-3)(n-4) = 5 \times 4 \times 3 \times 2 = 6 \times 5 \times 4$$

$$\therefore n-2 = 6 \Rightarrow n = 8. \quad \text{Ans: (8)}$$

32. The intercepts of the line $3x + 7y = 42$ on the x and y axes are $(14, 0)$ and $(0, 6)$ respectively.

We consider the rectangle formed with its edges on the x-axis and the y-axis and the diagonal with its extremities as the two intercepts thereby giving us the following figure



There are a total of 14×6 i.e. 84 squares within the rectangle. We need to consider the number of unit squares lying completely in the shaded region.

First, we need to count the number unit squares that the diagonal of the rectangle passes through (i.e., intersects). As the diagonals of a rectangle are congruent we can

consider the other diagonal as $y = \frac{6}{14}x$. This line passes

through 13 vertical lines ($x = 1, 2, \dots, 13$) and 5 horizontal lines ($y = 1, \dots, 5$). Such that every time we cross one of the above mentioned lines, we enter a new square. Since

$\frac{6}{14} = \frac{3}{7}$, we get an intersection of a vertical line and a horizontal line at the point $(7, 3)$. Therefore, the total number of squares intersected by the diagonal is $13 + 5 - 1 = 17$ squares.

In addition to this, we need to count the first square, which gives a total of 18 squares.

Therefore, the number of non-diagonal squares is $84 - 18 = 66$

We divide this by two to get the number of squares whose interiors lie entirely in the shaded region, which gives 33 squares.
Choice (A)

33. We know that $8\frac{1}{3}\% = \frac{1}{12}$ and $11\frac{1}{9}\% = \frac{1}{9}$

Since the compound interest needs to be calculated for two years we take a number which is divisible by $(12)^2$ i.e. 144 which is also divisible by 9
Let the value of P be 144k

$$SI_1 = \frac{1}{9} (144k) = 16k$$

$$SI_2 = 16k$$

$$\text{Similarly } CI_1 = \frac{1}{12} (144k) = 12k$$

$$CI_2 = \frac{1}{12} (144k + 12k) = 13k$$

Therefore, the total simple interest = 32k and the total compound interest = 25k

The difference between the total simple interest and the total compound interest, i.e., $32k - 25k = 364$

$$\Rightarrow k = 52$$

$$\therefore P = 144k = \text{Rs.7488}$$

Alternative Solution:

$$\text{Total simple interest} = \frac{2P\left(11\frac{1}{9}\right)}{100} = \frac{2}{9}P$$

$$\text{Total compound interest} = P\left(1+\frac{8\frac{1}{3}}{100}\right) - P$$

$$= P\left(1+\frac{1}{12}\right)^2 - P$$

$$= \frac{25}{144}P$$

$$\text{It is given that } \frac{2}{9}P - \frac{25}{144}P = 364$$

$$\Rightarrow P = \text{₹7488.}$$

Choice (D)

34. Let the total number of students be 100k

Number of boys = 68k

After the 25 girls joined, 64% of the students are boys.

$$\therefore \frac{68k}{100k+25} \times 100 = 64k$$

$$\Rightarrow 6800k = 6400k + 25(64k)$$

$$\Rightarrow 400k = 1600k$$

$$\therefore k = 4$$

Therefore, the initial number of students = $100x = 400$

The total number of engineers after the girls joined

$$= \frac{75}{100} (400) + 25 = 325. \quad \text{Choice (B)}$$

Difficulty level wise summary - Section III	
Level of Difficulty	Questions
Very Easy	3, 9
Easy	2, 11, 13, 15, 17, 21, 23, 31, 34
Medium	1, 5, 6, 7, 10, 14, 18, 19, 25, 26, 27, 29, 30, 33
Difficult	4, 12, 16, 22, 24, 32
Very Difficult	8, 20, 28