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# (Key and Solutions for AIMCAT1813)

## Key

### SECTION – I

| | | | | |
|---|---|---|---|---|
| 1. C | 8. B | 15. B | 22. 2 | 29. 36 |
| 2. D | 9. C | 16. C | 23. C | 30. 14 |
| 3. B | 10. D | 17. D | 24. D | 31. 3 |
| 4. C | 11. C | 18. A | 25. 24153 | 32. 4 |
| 5. A | 12. D | 19. C | 26. 35421 | 33. 347 |
| 6. B | 13. A | 20. A | 27. 51432 | 34. 25 |
| 7. D | 14. C | 21. D | 28. 245 | |

### SECTION – II

| | | | | |
|---|---|---|---|---|
| 1. 17000 | 8. B | 15. C | 22. B | 29. C |
| 2. B | 9. A | 16. B | 23. A | 30. D |
| 3. 90000 | 10. 23 | 17. B | 24. 41 | 31. 50 |
| 4. A | 11. C | 18. D | 25. C | 32. 25 |
| 5. A | 12. B | 19. B | 26. A | |
| 6. B | 13. A | 20. A | 27. D | |
| 7. C | 14. C | 21. D | 28. A | |

### SECTION – III

| | | | | |
|---|---|---|---|---|
| 1. 800 | 8. D | 15. B | 22. C | 29. B |
| 2. B | 9. B | 16. 100 | 23. 480 | 30. 42 |
| 3. A | 10. A | 17. B | 24. C | 31. 432 |
| 4. A | 11. C | 18. –5 | 25. C | 32. 18 |
| 5. D | 12. D | 19. 1 | 26. A | 33. 102 |
| 6. A | 13. C | 20. 14 | 27. C | 34. C |
| 7. B | 14. 21 | 21. 16 | 28. A | |

## Solutions

### SECTION – I

**Solutions for questions 1 to 6:**

**Number of words and Explanatory notes for RC:**

Number of words: 677

**1.** Refer to the first and second paras of the passage.
Option A: Choice A takes the phrase "midwives of ideas" too literally. Choice A is not the implication.
Option B: Choice B is nowhere implied in the given context.
Option C: The author explains Locke's conception further in para 2. Words are simply vehicles for ideas, which have an **independent, self-sustaining** existence. To use another metaphor, although words may be the midwives of ideas, their true parents are experience and reason. This makes choice C the answer.
Option D: [Man] should be able to use these sounds as signs of internal conceptions, and to make them stand as marks for the ideas within his own mind. This is a part of Locke's conception and not what the author specifically implies by the sentence in quotes in the question. Choice D is not the answer. Choice (C)

**2.** [Man] should be able to use these sounds as signs of internal conceptions, and to make them stand as marks for the ideas within his own mind; whereby they might be made known to others, and the thoughts of men's minds be conveyed from one to another. The only function language could have is to make those ideas and concepts public. This was also the view of Locke. Hence choice D is the answer. The remaining choices do not apply.
Choice (D)

**3.** Option A: According to Locke's conception, words are simply vehicles for ideas. ... Leibniz suggested the same model. This makes choice A correct. Therefore choice A is not the answer.
Option B: We know that Leibniz suggested the same model as Locke's, writing that "languages are the best mirrors of the human mind." But choice B is extreme and cannot be inferred from the passage. In the third para, it is mentioned that it was typical of Locke to see words as devices more for veiling truth than for revealing it. In his view, words have little or no cognitive function; indeed, they interfere with the direct contact possible between the mind and the light of truth. We do not know Leibniz's view with reference to this view of Locke. Hence choice B is the answer.
Option C: According to Locke's conception, ideas have an independent, self-sustaining existence. Leibniz suggested the same model. This makes choice C correct. Hence choice C is not the answer.
Option D: The only function language could have is to make those ideas and concepts public. This was the view of Aristotle, who wrote that "spoken words are signs of concepts." It was also the view of the English philosopher John Locke (1632–1704). Leibniz suggested the same model as Locke's. Choice D is correct. So choice D is not the answer. Choice (B)

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**4.** Refer to para 5 of the passage. The celebrated "Sapir-Whorf hypothesis" was formulated by the American linguists Edward Sapir (1884–1939) and Benjamin Lee Whorf (1897–1941).
Option A: Human beings do not live in the objective world alone…but are very much at the mercy of the particular language which has become the medium of expression for their society. Choice A is a distortion.
Option B: The intellectual climate of 18th-century Europe, shaped by increasing exposure to the histories and cultures of peoples outside the continent, tended to favour the second alternative (The mind is shaped by language.) over the first (language is shaped by the mind). But the first sentence of choice B does not emerge from the "Sapir-Whorf Hypothesis" discussed in para 5. The second sentence of Choice B is a weak interpretation of Sapir-Whorf Hypothesis. Choice B is not the answer.
Option C: According to its strongest interpretation, the hypothesis implies linguistic conceptual relativism, or "linguistic relativity," the idea that language so completely determines the thoughts of its users that there can be no common conceptual scheme between people speaking different languages. It also implies linguistic idealism, the idea that people cannot know anything that does not conform to the particular conceptual scheme their language determines. Choice C can be inferred to be true.
Option D: People cannot know anything that does not conform to the particular conceptual scheme their language determines. Choice D talks about ideas generated by language and is not the answer. Choice (C)

**5.** Refer to the last sentence of the passage. "Sapir-Whorf hypothesis" also implies linguistic idealism, the idea that people cannot know anything that does not conform to the particular conceptual scheme their language determines. Choice A best rephrases the last sentence of the passage. All the remaining choices are out of scope. Choice (A)

**6.** The author of the passage uses an explanatory style to describe the views of John Locke with reference to the role of language in carrying ideas as well as discuss the interpretations of the "Sapir-Whorf Hypothesis" . Choice B is the answer. Choice (B)

**Solutions for questions 7 to 9:**

**Number of words and Explanatory notes for RC:**

Number of words: 488

**7.** Refer to the first paragraph.
Option A: Choice A is not an objection to group life. Choice A is a distortion of what has been mentioned in para 1: The purpose of groups is to serve the egos of the few. Ignoring one's own identity is a great loss to the individual. Hence choice A is not the answer.
Option B: The characteristics of group life regulate the behaviour of individuals. But this is not true because often one individual influences the group. Choice B has not been mentioned in the passage. It is not the answer.
Option C: That one person should have total control over the activities of the others is not a desired objective. So a difficulty in the same will not be an objection to group life in society. Choice C is incorrect.
Option D: Groups are made up of egoistic individuals. The main objection of the author is that 'the interaction between group leaders and commoners is not based on equality' (para 1) and the followers have to blindly follow the leaders. Hence it will not result in an egalitarian society which is a desirable objective. Choice D is the answer.
Choice (D)

**8.** Option A: Choice A is not related to what has been discussed in the passage. It is out of scope of the given passage. Hence it is not the answer.
Option B: The concept of norms also implies social control. Therefore, norms and values know only how to control individuals for the sake of order. The main theme of the passage is that people should not follow the values and norms created by others but should follow their own. If values and norms are subjective they will vary according to individuals and hence will cause chaos in society. Hence choice B is the answer.
Option C: If people welcome change, then that is a positive thing. Authentic human beings should start changing the norms and intellectuals should accept and welcome the change because it would lead to better living conditions. Choice C is not the answer.
Option D: Choice D has been mentioned in the passage but it will not jeopardise the order in a society.
Choice (B)

**9.** We do not find any civilization anywhere. It is only a pretension to claim that people are modern; they are modern only in their passions. But their minds are old, rotten and orthodox. In modern times millions of people are killed in the names of race, religion and culture. The people who kill others are respected as great men. The present day killings in the name of religion, race, culture make the author wonder whether the present day civilization can be called one at all. Therefore choice C is the answer.
Option A: In modern times millions of people are killed in the names of race, religion and culture. Can the present day civilization be called one at all? The people who kill **others** are respected as great men. We do not find such an inhuman activity among animals. So choice A (which refers to cruelty shown by people towards animals) is not the correct reason.
Option B: The author raises an objection to the norms created by the past generations and which are still used by people today. But these age-old norms are not useful for the present generation because they do not allow any creative or clear understanding of the situation. People who follow these norms do not want to take the risk of creating new norms because it is easy to follow the ready-made ones. People searching for ready-made norms or values are no better than the primitives. But choice B is not specific to the question asked.
Option D: People searching for ready-made norms or values are no better than the primitives. But choice D is not the answer. Choice (C)

**Solutions for questions 10 to 15:**

**Number of words and Explanatory notes for RC:**

Number of words: 652

**10.** Disco was stereotypically identified with African-American performers (albeit predominantly white consumers) whereas punk was typed as a British phenomenon, although, in fact, both musical constituencies could be found in any of the wealthy nations that were starting in the 1970s... So choices A, B and C do not relate to the question as we are asked about music in the early 21st century. The objective of Disco and Pop was different. Also the skin colour of the performer does not matter. .... Much of the protest of injustice that is expressed musically in the early 21st century was done so through hip-hop. The last para not only says so, but provides examples as well.
Choice (D)

**11.** Rose says; in its origins, the music was both articulating and symbolizing the lived experience of people struggling to hold onto a community identity in the face of "urban development" and gentrification processes. The struggle, she insists, was not a final, futile gesture of victims of urban apocalypse, but was the formation of an **alternative, communally-forged identity** by producers of a conscious "take back the public spaces" movement. It was an intransigent, unapologetic assertion of the right of all human beings to take up public space, **to interact with each other and with the music that informed these politicized, reclaimed spaces**. Choice C is the answer. The remaining choices are far-fetched and do not apply.
Choice (C)

**12.** Elements of both these musical responses (i.e. disco and punk) to social marginalization and injustice are synthesized in hip-hop. ....The music was both articulating and symbolizing the lived experience of people struggling to hold onto a community identity in the face of "urban development" and gentrification processes. .... protest of injustice that is expressed musically in the early 21st century is done so through hip-hop .... justice appeals speak to people .... some attendees felt inspired to sing the Civil Rights-era anthem "We Shall Overcome" as an expression of their stand against homophobia ..... show case the diversity of musical styles that are speaking justice around the world. This makes choice D the correct answer.
Option A: The first part of choice A cannot be inferred from the passage. De-industrialization was just one theme that the music of the 1970s dealt with. Hence choice A is not correct.
Option B: Choice B cannot be inferred from the passage.
Option C: The ethnic poor were being crowded out of public space, and creative protest was fostered in the effort to reclaim for the people the neighbourhoods that were being torn apart to build expressways into the city for affluent suburban commuters. But choice C is not true.
Choice (D)

**13.** Refer to para 2. Elements of both of these musical responses to social marginalization and injustice are synthesized in hip-hop, the most popular musical form for expression of protest worldwide.
Option A: Subways, street corners, abandoned parks were occupied by listeners and dancers *as* political spaces. The elements of "flow, layering, and rupture" both reflect and contest social marginalization, Rose says; in its origins, the music was both articulating and symbolizing the lived experience of people struggling to hold onto a **community identity**. .... the formation of an alternative, communally-forged identity by producers of a conscious "take back the public spaces" movement .... politicized, reclaimed spaces. Hence choice A is the answer.
Option B: Poor people did oppose the development of the expressways. But choice B does not bring in the 'cultural refuse for pleasure' detail that is required to answer the question.
Option C: Into this unacknowledged war on the poor and the marginalized came the interplay of technology, economics, and culture at the origin of hip-hop, what Rose describes as a practice of appropriating cultural refuse for pleasure. Technology, economics and culture did not result in the social marginalization and injustice. Choice C is a distortion of facts.
Option D: Choice D again is a distortion of facts.
Choice (A)

**14.** Refer to the first para.
Option A: Disco represented a refusal to deal with social problems while punk rejected in no uncertain terms, the hypocrisy of the social establishment. Hence choice A is not correct.
Option B: Choice B is incorrect from para 2. Disco and Punk did not emerge out of a common source – Hip-Hop. Elements of both of these musical responses to social marginalization and injustice are synthesized in hip-hop.
Option C: Music that accompanied industrial decline in Western industrialized nations – notably the United States and the United Kingdom – articulated two distinct responses to the foreclosure of empowerment and idealism that the counterculture of the 1960s had nurtured. ... Both musical constituencies could be found in any of the wealthy nations that were starting in the 1970s to wrestle with de-industrialization, wage stagnation, and the corporate restructuring now known as outsourcing. Hence choice C is the answer.
Option D: Choice D is out of scope. Choice (C)

**15.** Option A: A narrative passage tells a story, usually from one person's viewpoint. A narrative passage is a sequence of events and follows a story telling format. A narrative passage neither presents any analysis nor evokes any emotions. This passage is not narrative. Hence choice A is not the answer.
Option B: The author mentions the post-industrial musical contestation and elaborates on disco, punk and hip-hop. The passage has an illustrative style. The last sentence of the passage gives us a clue – *as a **selection of examples** that showcase the diversity of musical styles that are speaking justice around the world.* So the author gives examples of various genres of music and how they have been an expression of the protest of injustice. (Elements of both of these musical responses i.e. disco and punk, to social marginalization and injustice are synthesized in hip-hop …, much of the protest of injustice that is expressed musically in the early 21st century is done so through hip-hop). Hence choice B is the correct answer.
Option C: Analysis involves examining aspects of a situation in its plusses and minuses, and making an evaluation at the end of it. In this passage, the author does not analyze a situation or and weighs up any study. Hence choice C is not the answer.
Option D: The passage is not argumentative. There is no debate i.e. the passage does not present arguments and counterarguments for any idea or concept. The author refrains from delivering an argument; neither does he try to convince people of an argument. Hence choice D is incorrect. Choice (B)

**Solutions for questions 16 to 18:**

**Number of words and Explanatory notes for RC:**

Number of words: 489

**16.** Option A: Double Jeopardy is a defense which prohibits the Government from trying a criminal defendant on the same or similar charges following that Defendant's acquittal of the same or similar charges **at a previous trial**, regardless of whether subsequent incriminating evidence is later found. Choice A tells us that the person was not put on trial. Hence Double Jeopardy is not applicable here.
Option B: Double Jeopardy is a defense which prohibits the Government from trying a criminal defendant **on the same or similar charges** following that Defendant's **acquittal of the same or similar charges** at a previous trial. Choice B has no reference to "same or similar charges". The person may be convicted a second time on a different charge. Hence choice B is not the answer.
Option C: The rational behind the bar of Double Jeopardy is **fairness** for the Defendant, and that **finality** is a paramount consideration, even more than discovering the truth in certain situations. Hence choice C is the correct answer.
Option D: Choice D may serve as an example of 'double jeopardy' in another context. It talks about a parallel situation: conviction of second degree murder and therefore an acquittal of first degree murder. But it is not the premise on which the Double Jeopardy operates, as can be inferred from the passage. Choice D is not the specific answer to the question. Choice (C)

**17.** Lawyers had resisted the notion of double jeopardy in the Nicole Brown Simpson and Ronald Goldman murder case. After all, they say, the first trial was criminal: the charge was murder, and Mr. Simpson stood to lose his liberty and possibly his life. The second was civil: different charges, and only money, not freedom, at stake. The objective of the second trial was to establish responsibility for the deaths and to set damages. Hence choice D is the answer. The remaining choices are far-fetched and are not the answers.
Choice (D)

**18.** The question was what could happen to O. J. should DNA testing of the knife prove that it was the murder weapon used in the slayings of Nicole Simpson and Ronald Goldman, especially if O. J.'s DNA is found on it as well. However, the Fifth Amendment to the United States Constitution would bar the Los Angeles County District Attorney's Office from reopening the case on the grounds of Double Jeopardy, regardless of whether O. J. now admitted the killings, or the knife otherwise conclusively implicated

him therein. Double Jeopardy is a defense which prohibits the Government from trying a criminal defendant on the same or similar charges following that Defendant's acquittal of the same or similar charges at a previous trial, regardless of whether subsequent incriminating evidence is later found.
But if the defense of Double Jeopardy was not applicable and O. J. Simpson's DNA was found on the knife discovered at his estate, then the knife would be a smoking gun. Smoking gun means 'a piece of incontrovertible incriminating evidence'. Choice A is the answer.
Option B: The passage does not focus on justice administered in double trials. Travesty of justice means a miscarriage of justice or an act of the legal system that is an insult to the system of justice. So choice B is not the correct answer.
Option C: "cut and dried case" means fixed; determined beforehand; usual and uninteresting. This idiom cannot be applied to the situation given in the question. Choice C is not the answer.
Option D: Logical inexactitude is used as a euphemism or circumlocution meaning a lie or untruth. If O. J. Simpson's DNA was found on the knife discovered at his estate, then one cannot use 'lies' or 'lack of integrity' to describe the situation. Choice D is not the answer.

Choice (A)

**Solutions for questions 19 to 24:**

**Number of words and Explanatory notes for RC:**

Number of words: 777

**19.** Actual cases of art fraud are exceptionally rare, although cases of "mistaken identity" are reasonably common.
Option A: Many leading artists were more than happy to create and sell additional versions within the studio, probably with even less personal involvement than before. All these possibilities present significant art historical and ethical problems in terms of identification and attribution, but perhaps raise important legal issues as well. This means that 'mistaken identity' could be the result of 'identification' problems, and, by implication could lead to historical problems. There is nothing in the context to rule out this possibility, so Choice A is inappropriate since it says 'the latter does not'.
Option B: A deliberate deception is clearly criminal. Creating a deliberate forgery for sale or attempting to pass off a fake or copy as an original is deception, and a criminal offence in most if not all countries. So the first part of choice B is true. The second part of choice B is not correct. ...reckless and unsupported exaggeration of an identification or attribution (either of which might be open to legal challenge in the civil courts for compensation). Hence choice B is not the answer.
Option C: While fraud shares with the wider interests the need to demonstrate deception (an obvious aspect of a fake), a successful prosecution will require in addition that the defendant be shown to be dishonest (that is, that the deception is intentional), that there is harm as a consequence, and that the victim was actually deceived….. It may not be easy to define exactly the boundaries between reckless and unsupported exaggeration of an identification or attribution, and a deliberate deception which is clearly criminal. Choice C is the answer.
Option D: Actual cases of art fraud are exceptionally rare, although cases of "mistaken identity" are reasonably common. However, a deliberate deception is observed in the case of art fraud and not in a case of 'mistaken identity'. Choice D is not the answer. Choice (C)

**20.** Option A: Many leading eighteenth-century portrait painters personally concentrated on the overall composition together with the face and perhaps hands, leaving the greater part of the canvas to be filled in by others ... Leading artists were more than happy to create and sell additional versions within the studio. ... All these possibilities present significant art historical and ethical problems in terms of identification and attribution. It may not be easy to define exactly the boundaries between a perhaps mistaken opinion made in good faith, reckless and unsupported exaggeration of an identification or attribution (either of which might be open to legal challenge in the civil courts for compensation), and a deliberate deception which is clearly criminal. ..... We are asked what difference it makes if a work is produced exactly like the genuine one. Hence choice A is the answer.
Option B: There are examples where a subsequent version, though substantially the same, may be regarded as the superior version. Choice B does not pose a significant historical and ethical problem.
Option C: Choice C has been provided as a reason for art fraud to be infrequently observed (para 1) but it is not the answer to the question.
Option D: *We* are *asked* what *difference* it *makes if* a *work* is *produced exactly like* the *genuine one*. But the fact that any work of art will be appreciated or not does not pose any historical and ethical problem. The question of appreciation of a work of art is not addressed in the passage. Choice D is not the answer. Choice (A)

**21.** Refer to the fourth para of the passage.
Option D: The author asks a related question in the second sentence of the fourth para of the passage: *We* are *asked* what *difference* it *makes if* a *work* is *produced exactly like* the *genuine one*. But the author doesn't really answer it. He moves on to another question which, in his opinion, is more pertinent……. However, the serious question is whether knowledge of these differences in any way impinges upon our appreciation of a work whose structure underdetermines the difference between authenticity and trumpery, or whether it makes no difference. I think one cannot say in advance whether it makes a difference or not. Hence choice D is the answer.
Option A: The distinction between genuine and fake must be established with reference to factors external to the works themselves – for example, with reference to their histories. But choice A does not tell us why it is important to distinguish between real art and fake art.
Option B: Monetary value has not been cited as a factor for considering it important to be able to distinguish between real art and fake art. Also, creating a deliberate forgery for sale or attempting to pass off a fake or copy as an original is deception, and a criminal offence. So the second part of choice B is not true. Hence choice B is not the reason.
Option C: Choice C is out of scope. Choice C may draw attention as it is given in the passage: ..... whose structure underdetermines the difference between authenticity and trumpery, or whether it makes no difference.

Choice (D)

**22.** (1): The author asks a related question in the second sentence of the fourth para of the passage: *We* are *asked* what *difference* it *makes if* a *work* is *produced exactly like* the *genuine one*. But the author doesn't really answer it. He moves on to another question which, in his opinion, is more pertinent……. However, the serious question is whether knowledge of these differences in any way impinges upon our appreciation of a work whose structure underdetermines the difference between authenticity and trumpery, or whether it makes no difference. So (1) can be posed to the author and is not the answer.
(2): Nothing has been mentioned about philosophy or modern art technology answering the questions put forth by the author. So (2) does not apply and is the answer.
(3): In the fourth para, the author says: The distinction between genuine and fake must be established with reference to factors external to the works themselves – for example, with reference to their histories. However, the serious question is whether knowledge of these differences in any way impinges upon our appreciation of a work whose structure underdetermines the difference between authenticity and trumpery, or whether it makes no difference. In the last para, he talks about generation of objects – in every manifest regard like perfectly ordinary objects – things like bottle-racks, snow-shovels, Brillo boxes, and beds. So (3) is a relevant question to ask the author. (3) is not the answer.

(4): The author talks about the designation of real things as artwork in the last para. But he does not dwell on the reasons for doing so nor does he give any argument or counterargument for the same. So (4) is a relevant question to ask the author. (4) is not the answer.
(5): In the fourth para, the author has made it clear that certain crucial factors are necessary to be understood to distinguish between our attitude towards duplicates and the real thing. We can ask him what these factors are. So (5) is the correct question to ask and is not the answer.
Hence question (2) does not serve the relevant purpose and is the answer. Ans: (2)

**23.** (a): The serious question is whether knowledge of these differences in any way impinges upon our appreciation of a work whose structure underdetermines the difference between authenticity and trumpery, or whether it makes no difference. I think one cannot say in advance whether it makes a difference or not. Hence (a) is correct and is the answer.
(b): (b) is out of scope of the given passage.
(c): The distinction between genuine and fake must be established with reference to factors external to the works themselves – for example, with reference to their histories. So (c) is not true.
(d): The method of philosophical duplication is a powerful lever for lifting factors into consciousness which otherwise never would have been alive – presumptions upon which our attitude towards the world has always depended though we might not have realized their crucial role since it never had been challenged. Therefore (d) is correct.
(e): .... All these possibilities present significant art historical and ethical problems in terms of identification and attribution, but perhaps raise important legal issues as well. So (e) is correct and is the answer.
(f): The passage does not talk about artwork in terms of monetary value. From the last para, we understand that real objects used regularly should also be considered as works of art. (f) is incorrect. So, (a), (d) and (e) are true.
Choice (C)

**24.** Option A: Choice A is wrong because the author does not compare human beings and artworks. The second sentence in choice A may be correct but choice A is not the main reason for the question.
Option B: The author mentions that artwork can be duplicated, but he talks about the duplication of human beings only in hypothetical terms, not as something that really can be done.
Option C: Choice C is out of scope. We cannot verify from the passage that the duplicate belongs to a different era and that all factors are improved upon in the duplicate. Some factors might also be missing when a duplicate is made.
Option D: Philosophical duplication is a powerful lever for lifting factors into consciousness which otherwise never would have been alive – presumptions upon which our attitude towards the world has always depended though we might not have realized their crucial role since it never had been challenged. These factors will always be logically external to the thing in question. Hence choice D is the answer. Choice (D)

**Solutions for questions 25 to 27:**

**25.** On a careful reading of the sentences, it can be observed that sentence 2 is a general sentence that begins the paragraph. It introduces the background: Rio de Janeiro to host the Olympic games in 2016. Sentence 2 is followed by sentence 4 as the latter provides a reason for the point made in the former. "seemed to deserve its nickname" in sentence 2 is linked with "violence had been falling for more than a decade" in sentence 4. Sentence 4 is followed by sentence 1. "economy was **also** booming" in sentence 1 is another factor for the point made in sentence 2: seemed to deserve its nickname (wonderful city). So, 241. Sentence 1 is followed by sentence 5. "So the organizers of the games claimed that it was an opportune time to show off a prosperous and self-confident city" in sentence 5 is a consequence of the factors given in sentences 4 and 1. Sentences 5 and 3 form a mandatory pair. "bury the idea that "Brazil is not a serious country"" links with Luis Inácio Lula da Silva's comment: "Those who give us this chance will not regret it." Sentence 3 concludes the para.
Ans: (24153)

**26.** 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 topic of discussion: jeong. Sentence 3 has the introductory words: One of the most subtle and powerful ideas ..... Sentence 3 is followed by sentence 5. "This multi-faceted concept" in sentence 5 refers to "jeong" introduced in sentence 3. Sentence 5 expands on the basic concept or features of jeong. "it's more than the sum of its parts" in sentence 5 links with "not just within a person but as much between people" given in sentence 4. "feelings of sympathy, reciprocity and human attachment" in sentence 5 links with "between people, permeating space and relationships with care and a sense of duty" in sentence 4. Sentence 2 follows sentence 4 as it tells us about the application of jeong in personal and professional spheres of life. Sentence 1 concludes the para with the specific application of jeong in medicine. So, 35421. Ans: (35421)

**27.** 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 topic of discussion: reasons why smart contracts may never become pervasive. Sentence 5 also tells us what smart contracts are. Sentence 5 is followed by sentence 1 which provides an example: "Imagine a contract ...." "pays out automatically" in sentence 1 is followed by "execute themselves automatically" given in sentence 5. Sentence 1 is followed by sentence 4. "Simple as that sounds in theory" in sentence 4 points to "Imagine a contract" in sentence 1. So, 514. Sentence 4 expands on what a blockchain is and that it gets in the way. Sentences 4 and 3 form a mandatory pair. The pronoun 'it' in sentence 3 points to the 'blockchain' in sentence 4. "blockchain, a special peer-to-peer database that provides a secure, public and trusted record of transactions" in sentence 4 links with "It is controlled collectively by many of its users" in sentence 3. "gets in the way" in sentence 4 links with "there is as yet no way around this: which duplicate of the contract should try to fetch the data?" in sentence 3. Sentence 3 is followed by sentence 2. "there is as yet no way around this: which duplicate of the contract should try to fetch the data?" in sentence 3 is followed by "To avoid such confusion" in sentence 2. "trusted parties, known as oracles, could supply the data to a blockchain" in sentence 2 tries to find a solution to the problem given in sentence 3: "which duplicate of the contract should try to fetch the data?" Sentence 2 concludes the para. "that would undermine the goal of agreements free of human caprice" in the conclusion sentence mirrors the thought of the introductory sentence 5: execute themselves automatically without any human intervention. So, 51432. Ans: (51432)

**Solutions for questions 28 to 30:**

**28.** The usage of the word 'air' is incorrect in sentences (2), (4) and (5).
In sentence (2), we need to say: We aired out all the mattresses for Christmas cleaning. "Aired out" means to expose something to fresh air (often to improve its scent).
In sentence (4), we need to use the idiom "up in the air" and not "on the air". "up in the air" means undecided about someone or something. So, we should say: The proposal to build a museum in the city is still up in the air.
In sentence (5), the plural 'airs' needs to be used. We should write: She can play some lovely Irish airs on the piano. (Here 'air' means tune, song, theme, melody, strain, lay etc. The usage of 'some' in the sentence indicates that we need to use the plural form of 'air')
The other statements have the correct usage of the word 'air'.
In sentence (1), 'air' means to bring to public notice; display.
In sentence (3), 'change of air' refers to 'change of environment'.

In sentence (6), the idiom 'clear the air' means to dispel differences, doubts, hard feelings or emotional tensions. Ans: (245)

**29.** The usage of the word 'revised' is incorrect in sentences (3) and (6).
In sentence (3), the word 'revised' needs to be replaced with 'adapted'. The book "Gone with the wind" was altered to make it suitable for filming (..... otherwise also for broadcasting, or the stage.)
In sentence (6), we need to say: Casualty figures on account of the cyclone were revised downwards.
The other statements have the correct usage of the word 'revised'.
In sentence (1), 'revised' means to reconsider.
In sentence (2), 'revised' mean improved or brought up to date.
In sentence (4), the first 'revised' means to change or modify. The second 'revised' means 'amended'.
In sentence (5), 'revised' means to study again what one has already learned, in preparation for an exam.
Ans: (36)

**30.** The usage of the word 'arc' is incorrect in sentences (1) and (4).
In sentence (1), the word 'arc' needs to be preceded by the article 'an'.
In sentence (4), we don't need to say: arcing in together. We can say: .... their hands arcing together. This means 'to form an arch'.
The other statements have the correct usage of the word 'arc'.
In sentence (2), the first 'arc' means 'a curved path'. The second reference 'arcing' means 'to move with a curving trajectory.'
In sentence (3), 'arc' means 'segment of a circle'.
In sentence (5), 'arced' means 'to move in the shape of an arc'.
In sentence (6), 'arc' is a noun and refers to the luminous electrical discharge between two electrodes or the powerful flow of electricity that goes across a space between two points. Ans: (14)

**Solutions for questions 31 and 32:**

**31.** On a careful reading of the sentences, it can be observed that sentence 2 is a general sentence that begins the paragraph. It introduces the topic of discussion: The ruling by the Permanent Court of Arbitration in The Hague is everything that China did not want it to be. Sentences 2 and 4 form a mandatory pair. "everything that China did not want it to be" in sentence 2 links with "not China's ill-explained "nine-dash line" which implies the sea is Chinese" in sentence 4. "how the waters of the South China Sea are divided among countries" in sentence 4 relates to "case brought by the Philippines (against China)" in sentence 2. "(The decision of the judges that) UNCLOS should determine how the waters of the South China Sea are divided among countries" in sentence 4 is "the firm and clear ruling of the Permanent Court of Arbitration in The Hague" mentioned in sentence 2. Sentence 1 continues the discussion with some more details of the ruling. Sentence 5 follows as a result or continuation of the point made in sentence 1. "cannot be defined as islands that can sustain human life" in sentence 1 links with "no country can assert an Exclusive Economic Zone (EEZ) extending upto 200 nautical miles around them". So, 2415. Sentence 3 is the odd man out as the situation discussed is not nencessarily related to the discussion about the ruling by the Permanent Court of Arbitration in The Hague: i.e. how the waters of the South China Sea are divided among countries. Sentence 3 needs a precedent and further elaboration. It can be a part of another paragraph later in the flow. Ans: (3)

**32.** On a careful reading of the sentences, it can be observed that sentence 3 is a general sentence that begins the paragraph. It has the proper noun "Louis Wirth" and introduces the topic of discussion: transitory nature of human ties. Sentence 3 is followed by sentence 5. "increase in the number of human relationships in urban society" in sentence 3 links with "average urban individual today probably comes into contact with more people" in sentence 5. Sentence 5 is followed by sentence 2. "than the feudal villager did in a year, perhaps even a lifetime" in sentence 5 links with "villager's ties .... transient relationships ..... same people throughout his life" in sentence 2. While sentence 2 talks about the villager's ties, sentence 1 goes on to talk about urban interactions once again. Sentence 1 follows sentence 2. "interacts with hundreds, perhaps thousands of people" in sentence 1 links with "The average urban individual today probably comes into contact with more people" in sentence 5 and "increase in the number of such relationships" given earlier in sentence 3. "most of the people the villagers knew were the same throughout his life" in sentence 2 compares with "core group of people with whom the urban man's interactions are sustained" in sentence 1 and **contrasts** "**but** he also interacts with hundreds, perhaps thousands of people whom he may see only once or twice" in sentence 1. Also "transient relationships" in sentence 2 points to "whom he may see only once or twice and who then vanish into anonymity" in sentence 1. So, 3521. Sentence 4 is the odd man out. It has new terms: modular relationships, return to the imprisonment of the past and 'social conventions, political norms and religious restrictions.' Sentence 4 does not fit in with the remaining sentences which highlight "transitory nature of human ties in urban society". Ans: (4)

**Solutions for question 33:**

**33.** 'Prelapsarian which means 'Of or relating to the period before a lapse/ fall' best fills up the first blank. 'edifying' and 'salubrious' are also positive words but they do not explain 'before Britain *kicked itself out of the European Union*'. So choice 3 best fills the first blank.
The second sentence in the para wishes to tell us when the idea behind the campaign called "Hug-a-Brit" was born. The idea can take hold. It cannot be dissembled (to disguise or conceal one's real nature, motives, or feelings behind a false appearance.) Similarly, it cannot be 'conjured away'. One can say 'conjured up' which means 'To call or bring to mind; evoke.' Choice 4 is the answer for the second blank.
We need to insert a sentence in the last blank. From the clues: "Hug-a-Brit", "Britishers were wanted in Europe", "Brits love-bombed by their European counterparts", "showered sympathy upon British friends" etc, we come to understand that sentence 7 is the best sentence to conclude and complete the para. Note that, "Romanians stand ready to adopt the Britishers who remain" is an example of "Colleagues from countries with long histories of bloody tyranny have showered sympathy upon British friends for their country's self-inflicted wound (of kicking itself out of the European Union)". Sentence 7 closes the para by providing a counterpoint.
Choice 8 cannot complete the para. It does not connect with the penultimate sentence. Choice 8 needs a precedent and more substantiation.
In choice 9, "But the sympathy won't last" is abrupt. Sentence numbered 9 cannot conclude the para as it will need a precedent and further elaboration. Ans: (347)

**Solutions for Question 34:**

**34.** Choices (2) and (5) make the sentence equivalent. Contingencies, in relation to history, would not mean future possibilities, but the unpredictabilities that led to happenings in history. Fortuitousness refers to the quality of happening accidentally and by lucky chance. The remaining choices are out of context. Contraventions would mean inconsistencies, not violations. Prerogatives refer to an exclusive right or privilege held by a person or group, especially a hereditary or official right. Politicization means to engage in or discuss politics. Congeries mean a collection; an aggregation. Contraventions point to the act of contravening or the state of being contravened; a violation, contradiction, or inconsistency. Ans: (25)

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

## SECTION – II

**Solutions for questions 1 to 4:**

In the given table, we can fill up the rows where two values are given (since Cost per tire × Number of tires = Total Cost).
The following table presents the updated information, with each row labelled from A to E for reference:

| Row | Cost per toy (in Rs./unit) | Number of toys | Total Cost (in Rs.) |
|---|---|---|---|
| A | 39 | | |
| B | 40 | 16500 | 6,60,000 |
| C | 21 | 19000 | 3,99,000 |
| D | | | 7,65,000 |
| E | 25 | 15000 | 3,75,000 |

From (ii), number of toys manufactured through Process III is 2000 more than that by Process IV. These two processes cannot be any combination of B, C and E since the difference between no two of them is 2000.
From (ii), Process IV can only be C, D or E (since only these can have the second lowest cost per toy).
From (v), Process III can only be A, B or D. However, from (iii), Process III cannot be D. Hence, Process III can only be A or B.
If Process III is A, Process IV can be C, D or E. If Process III is A, then the number of toys manufactured cannot be greater than $\frac{750000}{39} \cong 19230$ for the total cost to be less than 750000.
Therefore, Process IV cannot be C.
Let Process IV be D. Let the number of toys manufactured through Process IV be x. The number of toys manufactured through Process V will be x + 2000.
Since the average cost for all the five processes combined is 31.8,
31.8 × (x + 2000 + 16500 + 19000 + x + 15000) = 39 × (x + 2000) + 660000 + 399000 + 765000 + 375000
$\Rightarrow x \cong 24695$
We can say from this that Process IV cannot be D as well.
Let Process IV be E. Then, the number of toys manufactured through Process III will be 19000. This case satisfies all the conditions.
If Process III is B, Process IV cannot be C and E. Hence, Process IV can only be D. The number of units manufactured through Process IV will be 14500 and the cost per unit will be Rs. 57.76. However, this will violate condition (ii), as the cost per toy for this process will not be the second lowest.
Hence, Process III is A and Process IV is E.
The total cost for all the five processes combined =
39 × 17000 + 660000 + 399000 + 765000 + 375000 = 2862000

Let x be the number of units manufactured through D. From the average cost, the total cost = 31.8 × (x + 67500)
The number of units manufactured through D = 22500 and the cost per toy = 34
From (iii), D represents Process V. From (iv), C represents Process II and B represents Process I.

The following table provides the values for each process:

| Process | Cost per toy (in Rs./unit) | Number of toys | Total Cost (in Rs.) |
|---|---|---|---|
| III | 39 | 17000 | 6,63,000 |
| I | 40 | 16500 | 6,60,000 |
| II | 21 | 19000 | 3,99,000 |
| V | 34 | 22500 | 7,65,000 |
| IV | 25 | 15000 | 3,75,000 |

1. 17000 toys were manufactured through Process III. Ans: (17000)

2. The total manufacturing cost was the highest for Process V. Choice (B)

3. The total number of toys manufactured during the given month = 90000. Ans: (90000)

4. Hari will use Process II for manufacturing 90000 toys in the next month.
Total cost of manufacturing = 90000 × 21 = 18,90,000 Choice (A)

**Solutions for questions 5 to 8:**

Given that the sum of the ranks of any person is an odd number. Hence, for each person, one of the two ranks must be odd and the other even.
From (iv), C was ranked third in Dance. Since his rank in Dance is odd, his rank in Music must be even. Hence, his rank in Music can be 2/4/6. However, he was ranked better than at least 3 persons in Music. Hence, his rank in Music must be 2.
From (vi), F was ranked 4th in Music. Hence, his rank in Dance can be 1/3/5. Since C is ranked 3rd in Dance, F can be ranked 1/5 in Dance. From (vi), he is ranked worse than D in Dance. Hence, he cannot be ranked 1st in Dance. Hence, F must be ranked 5th in Dance.
From (ii), B cannot be ranked 1st or 2nd in Music (since C is ranked 2nd in Music).
From (iii), if A is ranked 1st in Music, D must be ranked 3rd in Dance. This is not possible as C is ranked 3rd in Dance. Hence, A cannot be ranked 1st in Music.
From (v), D can be ranked 4/5/6 in Music. Since F is ranked 4th in Music, D can be ranked 5/6 in Music.
E is the only person who can be ranked 1st in Music.
From (v), D cannot be ranked 1st in Dance and from (vi), D cannot be ranked 6th in Dance. He also cannot be ranked 3rd or 5th because C and F are ranked 3rd and 5th respectively.
Hence, D can only be ranked 2/4 in Dance. His rank in Music must be an odd number (since his rank in Dance is an even number). Therefore, D must be ranked 5 in Music.
If D is ranked 2 in Dance, A must be ranked 4th in Music, which is not possible as F is ranked 4th in Music. If D is ranked 4 in Dance, A must be ranked 6th in Music (as A cannot be ranked 4th). This is the only possibility. Hence, D is ranked 4th in Dance and A is ranked 6th in Music.
Since E is ranked 1st in Music, he must be ranked 2/4/6 in Dance. From (v), E must be ranked 2nd in Dance (since D is ranked worse than E in Dance).
Since A is ranked 6th in Music, he must be ranked 1st in Dance.
B is ranked 3rd in Music and must be ranked 6th in Dance.
The following table provides the ranks of each person in each stage:

| Person | Music | Dance |
|---|---|---|
| A | 6 | 1 |
| B | 3 | 6 |
| C | 2 | 3 |
| D | 5 | 4 |
| E | 1 | 2 |
| F | 4 | 5 |

5. Four persons (C, D, F and B) were ranked worse than E in Dance. Choice (A)

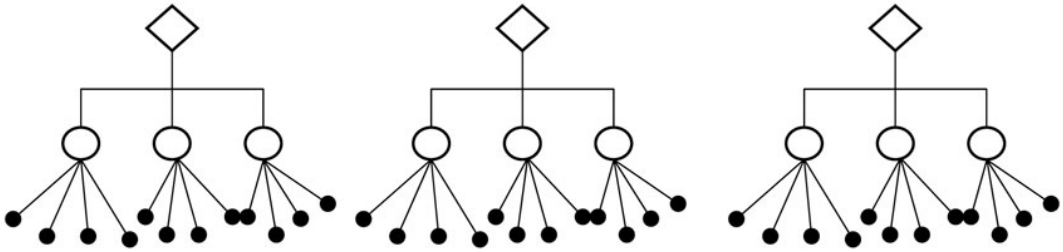
6. B was ranked third in Music. Choice (B)

7. Two persons (C and E) were ranked better than D in both Music and Dance. Choice (C)

8. E has the same rank in Music as A has in Dance. Choice (B)

**Solutions for questions 9 to 12:**

Let the diagram below represent the spy networks in the three kingdoms. The rhombus represents the kings, the circles represents the Chief Spies and the lines represent the Spies.



**9.** The table below provides the information regarding which person will be informed when and by whom. A, B and C represent the kingdom that each person is from. K, H and S represents king, Chief Spy and spy respectively. Multiple persons in the same kingdom in the same hierarchical level are numbered consecutively starting from 1. Hence, C-H1-S1 represents the spy (S1) under Chief Spy (H1) in Chilert (C).

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Day 1 | C-H1-S1 | | | | | | | |
| Day 2 | C-H1 | | | | | | C-H1-S2 | |
| Day 3 | C-K | | C-H2 | | | | C-H1-S3 | C-H1-S4 |
| Day 4 | A-K | B-K | C-H3 | | C-H2-S1 | | | |
| Day 5 | | | C-H3-S1 | C-H3-S2 | C-H2-S2 | C-H2-S3 | | |
| Day 6 | | | C-H3-S3 | C-H3-S4 | C-H2-S4 | | | |

By Day 6, all the persons in Chilert will have the information. From Day 5 onwards, whatever the king of Aritrea does, the king of Barnucopia can also do in the same manner. Hence, we need only keep track of one kingdom. The following table provides the way the information is shared from Day 4 onwards in Aritrea:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Day 4 | A-K | | | | | | | |
| Day 5 | A-H1 | | | A-H2 | | | | |
| Day 6 | A-H1-S1 | | A-H1-S2 | A-H3 | | | A-H2-S1 | |
| Day 7 | A-H1-S3 | A-H1-S4 | | A-H3-S1 | | A-H3-S2 | A-H2-S2 | A-H2-S3 |
| Day 8 | | | | A-H3-S3 | A-H3-S4 | | A-H2-S4 | |

Hence, by day 8, all the spies in all the networks in the three kingdoms will have this information. Choice (A)

**10.** For this question, we can use the above solution only difference being the kingdom from which the first spy in from (which we can safely ignore for solving the question). From the solution to the previous question, we can see that C-H3-S3 and C-H3-S4 (i.e., two spies in the third network in Chilert) need not have sent any pigeons. Also, C-H2-S3 and C-H2-S4 need not have sent any pigeons. Similarly, C-H1-S3 and C-H1-S4 need not have sent any pigeons.
Similarly, in Aritrea, eight spies need not have sent any pigeons. Same will be the case in Barnucopia. Hence, a total of 8 + 8 + 7 = 23 spies need not have sent any messages. Ans: (23)

**11.** In each spy network, only one spy can send a message. To maximize the number of persons to whom the information can be passed, all the Chief Spies and Kings must know the information. In the network that the first spy is in, he must be able to send the pigeons (otherwise we cannot maximize the number of persons who know the information). Hence, he can send to one other spy in his network. The other two spies will not know. In the second network in the same kingdom, the Chief Spy can send one pigeon to one of his spies (the other pigeon will be sent to the third Chief Spy). This spy in the second network can share with two other spies in his network. Hence, one spy in this network cannot get this information. In the third network, the Chief Spy can send information to two spies. One of the spies can send this information to the other two spies. Hence, all the persons under this Chief Spy will know this information.
In the other kingdom, the first Chief Spy can send two pigeons to his spies. One of them will inform the other two spies. The second Chief Spy can send one pigeon to his spy and another to the third Chief Spy. Hence, under the second Chief Spy one spy will not get the information. Under the third Chief Spy, all the spies will get the information. Hence, in this kingdom, one spy will not get the information.
The third kingdom will be similar to the second and hence, one spy in the third kingdom cannot get this information. Therefore, a total of 3 + 1 + 1 = 5 spies will not have the information. Choice (C)

**12.** Since only one person can be informed on each day, the day on which everyone will have the information will be the same as the total number of persons in all the spy networks (as one spy knew at the beginning of the first day itself). Since there are 48 persons across the spy networks, by day 48, everyone will have the information. Choice (B)

**Solutions for questions 13 to 16:**

Let 1, 2 and 3 represent the positions of the three persons.
Let the truth teller be at 1. Hence, he would have made the statements (i), (iv) and (vii).
From (i), Pip is to the left of Trip. Hence, Pip can be at 1 or 2. From (iv), Trip is wearing a Green dress. From (vii), Trip is to the right of Kip. Since Trip is to the right of both Pip and Kip, he has to be at 3. Pip and Kip will be at 1 and 2 in any order.
Since (vi) is true, it must have been the statement of an alternator. Hence, (iii), (vi) and (ix) must have been the statements of an alternator, of which (vi) is true and (iii) and (ix) are false. Further, the alternator must be at 3 ⇒ Trip is the alternator. The liar must be at 2. But this will make (iii) true. Hence, there is a contradiction in this case and this case is, therefore, not possible.
Let the truth teller be at 2. Hence, statements (ii), (v) and (viii) must be true.
The liar can be at 1 or 3. If the liar is at 3, then he would have made the statements (iii), (vi) and (ix) and all the three statements would have been false. But (iii) is true since the liar is to the immediate right of the truth teller. Hence, the liar cannot be at 3.
If the liar is at 1, then the statements (i), (iv) and (vii) must be false. From (i), Pip is to the right of Trip. Hence, Pip cannot be at 3. From (iv), Trip is not wearing a Green dress. From (vii), Trip is

to the left of Kip. Hence, Trip must be at 1. Since (viii) is true and Trip is the liar, he must be wearing a Red dress.
From (ii), the person wearing Blue dress is to the left of Pip. Hence, Pip must be at 3, Kip must be at 2 and wearing a Blue dress. Pip must be wearing a Green dress and is the alternator. Checking the statements that Pip made, (iii) is false, (vi) is true and (ix) is false. Hence, this case is possible.
Let the truth teller be at 3. In this case, (iii), (vi) and (ix) must be true. But (iii) cannot be true since the liar cannot be to the immediate right of the truth teller, who himself is at the extreme right. Hence, this case is not possible.
The following table presents the order in which they are standing and who the truth teller, alternator and liar among them are:

| **Position** | 1 | 2 | 3 |
|---|---|---|---|
| **Person** | Trip | Kip | Pip |
| **TT/L/A** | Liar | Truth teller | Alternator |
| **Colour** | Red | Blue | Green |

**13.** Statement (vii) was made by the liar. Choice (A)

**14.** Trip, the liar, is standing at the extreme left. Choice (C)

**15.** The liar is wearing a Red dress. Choice (C)

**16.** Pip is an alternator. Since Pip already made three statements, lie, truth, lie, in that order, the next statement, i.e, the response to Bobby's question, would be the truth. Since Kip is wearing Blue, Pip would have given the answer as Blue. Choice (B)

**Solutions for questions 17 to 20:**

From (i), B was the wife of D and lived in the house after H. Hence, B and D could have been either the second or third family to live in the house.
From (iii), F was the only child of G. F and G cannot be from the same family as B and D (since B and D are married to each other and G is the parent of F). Since F and G lived in the house after A, F and G can either be the second family or the third family.
From (iv), C was the daughter of I. Since F was the only child of G, C and I must be from a different family. Also, since B and D are wife and husband, C and I cannot be from the same family as B and D. Hence, C and I belong to another family. The family which lived in the house first can only be the family of C and I.
From (i), B and D lived after H. From (iv), C and I lived before H. Hence, H must be part of the second family that lived in the house. B and D must be the third family. Since B and D are the third family, F and G must be the second family. Hence, the second family comprised of F, G and H (there was no one else in the family because F was the only child of G). Since H is a male, H must be the husband, G must be the wife and F, their child.
From (ii), I must have two children, one of whom is C. From (iii), F and G lived after A. Hence, A belongs to the same family as C and I. From (v), J lived after E. Hence, E must belong to the family of C, I and A. J must belong to the family of B and D.
From (v), the only person who can have a brother is C. Since E lived with his parents, E must be the son of I and A and the brother of C. Since A is not the father of C, A must be the mother and I must be the father. From (v) J is a male and from (vi), F must be a female.
The following table provides the persons who lived in the house:

| Order | Parents | Children |
|---|---|---|
| 1 | I (m), A (f) | E (m), C (f) |
| 2 | H (m), G (f) | F (f) |
| 3 | D (m), B (f) | J (m) |

**17.** E is the son of A. Choice (B)

**18.** B is the mother of J. The answer is not in the given options. Choice (D)

**19.** Among the given options, E is a male who lived in the house before D did. Choice (B)

**20.** F is a female who lived the house with her parents. Choice (A)

**Solutions for questions 21 to 24:**

From the table, we can see that A was in the first position at the beginning of the race. D overtook A after 12 seconds. However, later on, each of B, H, F, I, C, G and E must have overtaken D, since each of them were in the lead at some point during the race. Hence, D could not have overtaken B, H, F, I, C, G and E, when he was first. Hence, D could have been 2$^{nd}$ or 3$^{rd}$ at the beginning of the race. If he was 2$^{nd}$, A was the one person in front of him. If he was 3$^{rd}$, both J and A were in front of him.
Similarly, B could have been 3$^{rd}$ or 4$^{th}$. H could have been 4$^{th}$ or 5$^{th}$. F could have been 5$^{th}$ or 6$^{th}$. I could have been 6$^{th}$ or 7$^{th}$. C could have been 7$^{th}$ or 8$^{th}$. G could have been 8$^{th}$ or 9$^{th}$. E could have been 9$^{th}$ or 10$^{th}$.
Hence, the starting position of the nine runners is A, D, B, H, F, I, C, G and E, in the same order. J can be in any position except the first position.

**21.** C was in the first position from 0:52 to 1:01, i.e., for 9 seconds. G could have been second when C was in the first position.
G could have been in the second position, when E was in the first place, i.e., for 6 seconds. Hence, G could have been in the second position for a maximum of 15 seconds. Choice (D)

**22.** Since E was the first to finish the race, J must have overtaken all the other 8 runners to be in the second position at the end of the race. Since he overtook all the other 8 runners, none of them would have overtook J during the race. This is possible only if J is standing behind all the 8 runners. Hence, the minimum number of runners who were in front of him at the beginning of the race will be 8 (E could have been the last and overtook all the others during the race). Choice (B)

**23.** Given that J was second at some point in the race. However, among all the persons in front of J, he cannot overtake anyone until that person has gone to the first place. This is because if J overtook a person, say X, and later X came to the first position, this implies that X also overtook J. This violates the given condition.
If J was the second person at the beginning of the race, he would have spent a total of 12 seconds in the second position. After D overtook A and J, J could have overtaken A at the same time and J would still be 2$^{nd}$ when D was first. Hence, the maximum time that J could have been second in this case was 15 seconds. J could not be second anytime afterwards because all the persons who were in the first position subsequently would have overtaken J.
If J was third at the beginning of the race, he could have been in the second place when D was in the first place (for 3 seconds). When B comes to the first position, J could have overtaken D and stayed in the second place as long as B was first (i.e., for 5 seconds). Hence, J could have been second in this case for a maximum of 8 seconds.
Similarly, we can calculate the maximum time that J was second in different cases.
If J was fourth at the beginning of the race, the maximum time he can be 2$^{nd}$ is 20 seconds.
If J was fifth at the beginning of the race, the maximum time he can be 2$^{nd}$ is 29 seconds.
If J was sixth at the beginning of the race, the maximum time he can be 2$^{nd}$ is 17 seconds.
If J was seventh at the beginning of the race, the maximum time he can be 2$^{nd}$ is 12 seconds.
If J was eighth at the beginning of the race, the maximum time he can be 2$^{nd}$ is 22 seconds.
If J was ninth at the beginning of the race, the maximum time he can be 2$^{nd}$ is 19 seconds.

If J was tenth at the beginning of the race, the maximum time he can be 2nd is 6 seconds.
Since he spent 14 seconds in the second place, he could have been 4th, 5th, 6th, 8th or 9th. Among the given options, the number of runners in front of him can be 3 or 4 or 5. Hence, three options satisfy the given condition.
Choice (A)

**24.** Consider J was in the second position at the beginning of the race. When D comes to the first position, J will be 3rd. After B comes to the first position, J can overtake A at the same time and still be in third position. However, when H comes to the third position, J cannot overtake either B or D (as they both overtook J). From this point onwards, he cannot come to the third position again. Hence, J can be in the third position for a maximum of 8 seconds (when either D or B were in the first position).
If J was in the third position, J will be third when A is first. When D is first, J can still be in the third position. When B comes first, J can overtake A and be in the third position. When H comes to the first position, J can overtake D and come to the third position. However, when F comes to the first position, J cannot be third (because he cannot overtake H or B) and can only be fourth. Hence, J can be in the third position when A is first, D is first, B is first and H is first, for a total of 35 seconds.
If J was in the fourth position, when D comes first, B could have overtaken A and J could have overtaken A. In this case, J would be third when D was first. When B goes first, J will still be third. When H goes first, J can overtake D and remain at third. When F goes first, J can overtake B and remain at third. Hence, J will be first when D was first, B was first, H was first and F was first. The maximum time for which J can be third = 37 seconds.
If J was in fifth position, J will be first when B comes first and J overtakes A and D. Similarly, J will be first when H comes first, when F comes first and when I comes first. In this case, J will be third for a maximum of 37 seconds.
Similarly, we can calculate the maximum time for which J can be third.
If J was sixth, J can be in third position for 41 seconds.
If J was seventh, J can be in third position for 39 seconds.
If J was eighth, J can be in third position for 31 seconds.
If J was ninth, J can be in third position for 28 seconds.
If J was tenth, J can be in third position for 19 seconds.
Hence, the maximum time for which he can be third is 41 seconds. Ans: (41)

**Solutions for questions 25 to 28:**

Let N30 represent the number of employees whose age is at most 30 and N40 represent the number of employees whose age is more than 30 but at most 40.
In 2010, N30 is 11 and N40 is 10.
In 2011, the number of people in the two groups will remain the same.
In 2012, two people aged 29 in 2010 will move to N40. Hence, N30 will become 9. Piyush will hire 3 people aged 25. Therefore, N30 will increase to 12. N40 will be 12.
In 2013, 3 employees aged 28 in 2010, will move to N40. Hence, N30 will become 9. Piyush will hire 3 more employees aged 25. This will increase N30 to 12. Since three employees moved to N40, N40 will be 15. But 6 employees aged 38 will move out of N40. Hence, N40 will decrease to 9. Piyush will hire 2 employees aged 33. N40 will become 11.
In 2014, N30 and N40 will not change. N30 will be 12 and N40 will be 11. Further, the 3 employees aged 47 in 2010 will retire as they would have crossed 50 years.
In 2015, one employee aged 26 in 2010 will move to N40. This will make N30 11, and N40 12.
In 2016, one employee aged 35 in 2010, will move out of N40. Hence, N40 will become 11. N30 will remain 11.

**25.** Piyush hired 3 employees in 2012 and 5 employees in 2013. Hence, he hired a total of 8 employees.
Choice (C)

**26.** The number of employees in the company in 2010, 2011 = 24
Number of employees in the company in 2012 = 27
Number of employees in the company in 2013 = 32
Number of employees in the company in 2014, 2015 and 2016 = 29
Highest number of employees in the company in any year = 32
Choice (A)

**27.** Average age of employees in the company in 2010

$$= \frac{23\times2+24\times3+26\times1+28\times3+29\times2+31\times2+33\times1+35\times1+38\times6+47\times3}{24}$$

= 32.71
In 2011, the average age of the employees will increase by 1 and will be 33.71.
In 2012, the average of the employees will increase to 34.71 if no one was hired. However, three employees aged 25 were hired.

$$\text{Average age} = \frac{34.71\times24+25\times3}{27} = 33.63$$

In 2013, the average age if no one else was hired will be 34.63. However, three employees aged 25 and two employees aged 33 were hired.

$$\text{Average age} = \frac{34.63\times27+25\times3+33\times2}{32} = 33.625$$

In 2014, the average age of employees will be 34.625 if no employee retired. However, three employees aged 51 retired.

$$\text{Average age} = \frac{34.625\times32-51\times3}{29} = 32.93$$

In 2015 and 2016, the average age will increase by 1 each.
Hence, among the given years, the lowest average age was in 2014. Choice (D)

**28.** In 2010, number of employees aged less than 30 = 11
Number of employees aged more than 35 = 9
In 2011, number of employees aged less than 30 = 9
Number of employees aged more than 35 = 10
In 2012, number of employees aged less than 30 = 9
Number of employees aged more than 35 = 10
In 2013, number of employees aged less than 30 = 12
Number of employees aged more than 35 = 11
In 2014, number of employees aged less than 30 = 11
Number of employees aged more than 35 = 8 (since three employees retired)
In 2015, number of employees aged less than 30 = 11
Number of employees aged more than 35 = 10
In 2016, number of employees age less than 30 = 8
Number of employees aged more than 35 = 12
The number of employees aged less than 30 is greater than the number of employees aged more than 35 in four years ,i.e., 2010, 2013, 2014 and 2015. Choice (A)

**Solutions for questions 29 to 32:**

From (i) and (ii), the scores of Mani, Raghu and Dinesh in each section will be 5, 10 and 15 in any order. Hence, for each section, the sum of the marks of these three students will be 30. Hence, across the five sections, their sum will be 150. Given total marks scored by the five students across the five sections = 45 + 50 + 50 + 45 + 55 = 245
Hence, the score of Lalit (from (vi)) will be 245 – 150 – 35 = 60.
From (iv), the sum of the scores of Tarak and Lalit in each section will be 15, 25, 20, 15 and 25. Given that the scores of these two students are not the same in any section. Hence, their scores will be (5,10), (15,5), (5,15), (5,10) and (15,10). From (v), Tarun and Lalit should have scored 15 marks in at least one section.
From (vi), the total marks of Tarun are 35. If he scores 15 in one section, in each of the other sections, he must have scored 5 marks (since 15 + 4 × 5 = 35). From (vii), he scored 15 in VA and 5 marks in each of the other subjects. Also, Lalit would have scored 10 in VA and he would have scored 15 marks in exactly 2 sections.

From (iii), Raghu must have scored 15 each in LR and RC. Since no other student would have scored 15 in that section, the two sections that Lalit would have scored 15 in, has to be QA and DI. In LR and RC, Lalit must have scored 10 each.
In QA, Raghu could not have scored 5 or 15 (since Tarun and Lalit scored 5 and 15 marks respectively, and condition (v) states that no student scored the same as Raghu in any section). Hence, Raghu would have scored 10 in QA. Similarly, he would have scored 10 in DI, and 5 in VA.
Since Mani scored more than Dinesh in QA, he must have scored 15 and Dinesh must have scored 5. From (vii), Dinesh scored 15 in VA and hence, Mani would have scored 10 in VA. Since Mani scored 15 in two sections, he must have scored 15 in DI and Dinesh would have scored 5 in DI.
Mani can score 5 or 10 in LR and RC. If he scores 5 in each of the two sections, his total marks would become 50, which will be distinct from the total marks of the other students. If he scores 5 and 10 in the two sections, his total marks will be 55, which is the same as the total marks scored by Raghu. Hence, this is not possible. If he scores 10 marks each in the two sections, his total will become 60 which is the same as the total marks scored by Lalit. Hence, he can have a score of 5 in each of the two sections. This implies that Dinesh would have scored 10 marks in each of the two sections.
The following table presents the marks scored by each student in each section and the total marks across all the five section:

| | QA | LR | DI | VA | RC | Total |
|---|---|---|---|---|---|---|
| **Dinesh** | 5 | 10 | 5 | 15 | 10 | 45 |
| **Lalit** | 15 | 10 | 15 | 10 | 10 | 60 |
| **Mani** | 15 | 5 | 15 | 10 | 5 | 50 |
| **Raghu** | 10 | 15 | 10 | 5 | 15 | 55 |
| **Tarun** | 5 | 5 | 5 | 15 | 5 | 35 |

**29.** The highest marks are scored by Lalit. Choice (C)

**30.** The sum of the scored of the five students in QA, LR, DI, VA and RC are 50, 45, 50, 55 and 45 respectively. Hence, the highest score was in VA. Choice (D)

**31.** The total marks scored by Mani across all the five sections = 50. Ans: (50)

**32.** The difference between the highest score and the lowest score = 25. Ans: (25)

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

## SECTION – III

**Solutions for questions 1 to 11:**

**1.** $x_{n+1} = 5x_n + 3 - 12n$
$x_0 = 1$
$\therefore x_1 = 5x_0 + 3 - 12(0) = 8$
$= 5^1 + 3(1)$
$x_2 = 5x_1 + 3 - 12(1)$
$= 31 = 5^2 + 3(2)$
$x_3 = 5x_2 - 12(2) + 3$
$= 134 = 5^3 + 3(3)$
$\therefore x_n$ can be seen to have a general form of $5^n + 3n$
$\therefore x_{200} = 5^{200} + 3(200) = 5^{200} + 600$.
$\therefore k = 200$ and $m = 600 \Rightarrow m + k = 800$.
This is least possible value of $(m + k)$ as $k$ cannot be increased beyond 200 without making $m$ negative and any decrease in $k$ will result in a large increase in $m$ (thereby increasing $(m + k)$). Ans: (800)

**2.** If the year is a non-leap year, the number of odd days will be January-3, February-0, March-3, April-2, May-3, June-2, July-3, August-3 and September-2.
Total number of odd days
= 3 + 0 + 3 + 2 + 3 + 2 + 3 + 3 + 2 = 21 days

As 21/7 = 0, October 1st is the same day as January 1st. Thus, October will have 5 Saturdays and 5 Sundays. The person will not work on 3 Saturdays and 3 Sundays
$\Rightarrow$ The person works for 31 – 6 = 25 days.

If the year is a leap year, there will be 22 odd days $\frac{22}{7}$ will have a remainder of 1. Thus 1st October will be a Saturday, in which case also it will have 5 Saturdays and 5 Sundays.
$\Rightarrow$ The person works for 25 days. Choice (B)

**3.** Given, $a_1 = 1$ and $a_{11} = 15$.
There are 10 tosses corresponding to the terms $a_2$ to $a_{11}$. A heads or a tails increases the value of the term by at least one. So $a_{11}$ is at least $a_1 + 10 = 11$ (but $a_{11} = 15$)
The extra 4 comes because there are exactly 4 heads, (and hence 10 – 4 = 6 tails).
All these 6 tails could be consecutive. Choice (A)

**4.** Let the cost of an eraser be '$e$', sharpener be '$s$' and pencil be '$p$'
$9e + 7s + 5p = 38 \rightarrow (1)$
$4e + 3s + 2p = 16 \rightarrow (2)$
As the co-efficients in both the equations are in A.P., multiply the first equation with the common difference of the second equation and second equation with the common difference of the first equation.
$\therefore 2 \times (2) \Rightarrow 8e + 6s + 4p = 32 \rightarrow (3)$
$(1) - (3)$ will give $e + s + p = 6 \rightarrow (4)$
As e, s and p are all distinct natural numbers, they should take values among 1, 2 and 3.
Now $(2) - 2(4) \Rightarrow 2e + s = 4 \rightarrow (5)$
Among 1, 2 and 3, $e$ and $s$ can take 1 and 2 respectively to satisfy (5).
$\Rightarrow p = 3$
Cost of 2 pencils and 3 sharpeners = $2 \times 3 + 3 \times 2$ = ₹12.

**Alternative Solution:**
Taking the difference of the two equations gives
$5e + 4s + 3p = 22$.
Also, each of $e$, $s$, $p$ is a distinct natural number. It can be observed that the least possible value of the LHS is $(5 \times 1) + (4 \times 2) + (3 \times 3) = 22$. Which implies that $e = 1$, $s = 2$ and $p = 3$ is the only solution and hence, $2p + 3s = 12$.
Choice (A)

**5.** There are six digits - 0, 1, 2, 3, 4 and 5. To form 5-digit numbers, we need exactly 5 digits. So we should not be using one of the digits.
The sum of the numerals 0, 1, 2, 3, 4 and 5 is 15. We know that a 5-digit number is divisible by 3, if and only if the sum of its digits is divisible by '3'. Therefore, we should not use either '0' or '3' while forming the five-digit numbers - only then will it be divisible by '3'.
If we do not use '0', then the remaining 5 digits can be arranged in 5! ways = 120 numbers.
If we do not use '3', then the remaining arrangements that are possible (without '0' being the first digit) are 5! – 4! = 120 – 24 = 96 numbers.
Therefore, there are a total of 120 + 96 = 216 such numbers can exist. Choice (D)

**6.** $f(x) = f(x^2 - x + 1)$
$\Rightarrow f(2) = f(2^2 - 2 + 1) = f(3)$
further $f(3) = f(3^2 - 3 + 1) = f(7)$
Hence, we get
$f(2) = f(3) = f(7)$
since $f(2) = 5$ (given), $f(7) = 5$. Choice (A)

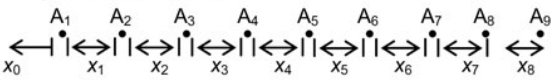
**7.** Given (cosec A + cot A) (cosec B + cot B) (cosec C + cot C) = (cosec A – cot A) (cosec B – Cot B) (cosec C – cot C) ...(1)
Multiplying (1) by
(cosec A + cot A) (cosec B + cot B) (cosec C + cot C),

we have
$\{(\text{cosec } A + \cot A)(\text{cosec } B + \cot B)(\text{cosec } C + \cot C)\}^2$
$= (\text{cosec}^2 A - \cot^2 A)(\text{cosec}^2 B - \cot^2 B)(\text{cosece}^2 C - \cot^2 C) = 1$
$\therefore$ (cosec A + cot A) (cosec B + cot B) (cosec C + cot C) = (cosec A – Cot A) (cosec B – cot B) (cosec C – cot C) = $\pm 1$
Choice (B)

**8.** Since, all the tokens are worth an odd number of rupees, the sum of exactly 8 (i.e., an even number of) such tokens will always be even.
$\therefore$ No such way is possible. Choice (D)

**9.** Given $(2 + x + x^3)^5 = a_0 + a_1 x + a_2 x^2 + \ldots\ldots + a_{15} x^{15}$
put $x = 1$, we get
$4^5 = a_0 + a_1 + a_2 + \ldots\ldots + a_{15}$ ------(1)
put $x = -1$, we get
$0 = a_0 - a_1 + a_2 - a_3 \ldots\ldots - a_{15}$ ------(2)
(1) + (2) gives
$2(a_0 + a_2 + a_4 \ldots\ldots + a_{14}) = 1024$
$\therefore (a_0 + a_2 + a_4 + \ldots\ldots + a_{14}) = 512$ Choice (B)

**10.** Let us denote the MOCK CATS to be attempted by Pradip by A*i* where *i* = 1 to 9.




Let us denote the number of MOCK CATS not attempted by Pradip before $A_1$, those between $A_1$ and $A_2$, those between $A_2$ and $A_3$, and so on upto those between $A_8$ and $A_9$ as $x_0, x_1, x_2, \ldots, x_8$ respectively.
Now $x_0 + x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 + x_8 = 23 - 9 = 14$
where $x_0 \geq 0$ and $x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8 \geq 1$.
Let $x_0 + 1 = x_9$. $\therefore x_1 + x_2 + \ldots\ldots + x_9 = 14 + 1 = 15$
The number of positive integral solutions of the above equation $= {}^{15-1}C_{9-1} = {}^{14}C_8 = 3003$ Choice (A)

**11.** 2 – Red balls
8 – Green balls
10 – Blue balls
Minimum number of balls which need to be picked out could have following colours.
R, R, G, G, G, B, B, B, (G/B)
$\Rightarrow$ At least four G/B balls.
Total number = 9 Choice (C)

**Solutions for questions 12 and 13:**

**12.** Consider $f_2(M)$ in the binary system. Since $8 = 2^3$, we can write each digit of $f_8(M)$ as a 3-bit binary number. Then $f_2(M) = 011011\ldots$upto 900 digits of base 2 (or bits)
To find $f_4(M)$ we need to consider the binary equivalent of $f_2(M)$ in groups of two bits (since $4 = 2^2$) and represent each group as a single digit. Thus, the 3 groups in the last 6 bits 011011 are 01, 10 and 11 which are represented as 1, 2 and 3 respectively in base 4. This pattern repeats, i.e., for every set of six digits.
$\therefore f_4(M) = 123123\ldots\ldots$ upto 450 digits. Choice (D)

**13.** Consider $f_2(M)$,
$f_2(M) = 100100100 \ldots\ldots\ldots$ upto 600 digits.
$f_2(2M + 1) = 2 \times (100100 \ldots\ldots\ldots$ upto 600 digits) + 1
$= 2 \times (1 \times 2^{599} + 2^{596} + \ldots\ldots\ldots + 1 \times 2^2) + 1$
$= 2^{600} + 2^{597} + \ldots\ldots\ldots + 2^3 + 2^0$
$= 100100 \ldots\ldots\ldots 1001$(601 digits)

To find $f_4(2M + 1)$ we need to consider $f_2(2M + 1)$ in groups of two digits and represent each group as a single digit. Thus the 3 groups in the last 6 bits 001001 are 00,10 and 01 which are represented as 0, 2 and 1 respectively in base 4.
$\therefore f_4(2M + 1) = 102102 \ldots\ldots\ldots$ upto 301 digits.
Choice (C)

**Solutions for questions 14 to 17:**

**14.** It can be observed that S = Sum of all numbers on all the faces of the three dice – Sum of the three numbers that are on the top faces.
Since, sum of all the numbers on all the three dice is a constant (equal to $(1 + 2 + 4 + 5 + 6 + 8) \times 3$) we need to only find the number of distinct possible sums of the numbers on the three top faces.
Clearly, the maximum value of the sum of the numbers on the three top faces is 8 + 8 + 8 = 24.
The minimum value for the sum is 3. By trial and error, it can be observed that out of the values between 3 and 24 (both inclusive) only 23 is not possible.
Hence a total of 21 distinct sums are possible.
Hence, accordingly S can assume only 21 distinct values.
Ans: (21)

**15.** The probability of either a 2 or a 3 turning up for a die
$= \frac{2}{6} = \frac{1}{3}$
The probability that neither a 2 nor a 3 turning up
$= 1 - \frac{1}{3} = \frac{2}{3}$
The probability that neither a 2 nor a 3 turning up on any of the three dice $= \frac{2}{3} \times \frac{2}{3} \times \frac{2}{3} = \frac{8}{27}$
The probability that either a 2 or a 3 turning up on at least one of the dice $= 1 - \frac{8}{27} = \frac{19}{27}$. Choice (B)

**16.** The pattern of ₹100 and ₹500 bills dispensed for successive multiples of 100 (starting from 100) is given below.

| No. of ₹500 Bills | No. of ₹100 Bills | Total amount dispensed (in ₹) |
|---|---|---|
| 0 | 1 | 100 |
| 0 | 2 | 200 |
| 0 | 3 | 300 |
| 0 | 4 | 400 |
| 1 | 0 | 500 |
| 1 | 1 | 600 |
| 1 | 2 | 700 |
| 1 | 3 | 800 |
| 1 | 4 | 900 |
| 2 | 0 | 1000 |
| 2 | 1 | 1100 |
| 2 | 2 | 1200 |
| 2 | 3 | 1300 |
| 2 | 4 | 1400 |
| 3 | 0 | 1500 |
| ⋮ | ⋮ | ⋮ |

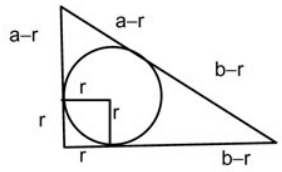
The values in the first and the second columns in the above table can be written by totalling sets of five rows (four in the case of the first four rows).

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| No. of ₹500 bills | 0 | 5 | 10 | 15 | 20 | 25 | … |
| No. of ₹100 bills | 10 | 10 | 10 | 10 | 10 | 10 | …. |

It can be seen that at (0 + 5 + 10 + 15 + 20)
= (10 + 10 + 10 + 10 + 10), 50 bills of each of ₹100 and ₹500 were dispensed.

Hence a total of 50 + 50 = 100 bills could have been dispensed. Beyond this, it can be observed that the number of ₹500 bills dispensed increases faster than the number of ₹100 bills. Hence, 100 bills is the maximum number of bills dispensed for which the total number of 100 and 500 bills will be equal. Ans: (100)

**17.** Let a and b be the perpendicular sides of the triangle and r be the inradius.




Perimeter of the triangle
= a – r + r + r + b – r + a – r + b – r
= 2r + 2 (Hypotenuse) = 2r + 2 (2R) = 2 (r + 2R)
Area of the triangle = r (semi-perimeter)
= r (r + 2R) = 6 [6 + 2 (25)] sq.cm = 336 sq.cm.
Choice (B)

**Solutions for questions 18 and 19:**

$f(x) = 1 - h(x)$ …… (1)
$g(x) = 1 - k(x)$ …. (2)
$h(x) = f(x) + 1$ ….. (3)
$j(x) = g(x) + 1$ ……..(4)
$k(x) = j(x) + 1$ ……..(5)
Solving for $h(x)$ and $f(x)$ from (1) and (3)
(1) + (3) gives
$f(x) + h(x) = 1 - h(x) + f(x) + 1$
$\Rightarrow 2h(x) = 2$
$\Rightarrow h(x) = 1$ …….. (6)
from (6) in (1)
$f(x) = 1 - 1 = 0$ ….. (7)
Similarly solving (2), (4) and (5) for g($x$), j($x$) and $k(x)$ we get
$g(x) = -1/2$ …….. (8)
j($x$) = 1/2, and ……. (9)
$k(x) = 3/2$. …… (10)

Note: all functions are constant.

**18.** The expression given

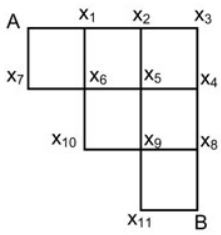
simplifies to $\dfrac{\left(-\frac{1}{2}+\frac{1}{2}+\frac{3}{2}\right)}{\left(-\frac{1}{2}+\frac{1}{2}+\frac{3}{2}\right)\left(-\frac{1}{2}\cdot\frac{1}{2}\cdot\frac{3}{2}\right)} = -8/3.$

$\therefore m = -8$ and $n = 3$ ($\because n \geq 0$) and
$m + n = -5$. Ans: (–5)

**19.** $\dfrac{h(f(x))+f(h(x))}{h(f(x)+h(x))} = \dfrac{1+0}{1} = 1$ Ans: (1)

**Solutions for questions 20 to 25:**

**20.**




Label the corners of each square as shown where the label at each corner indicates number of distinct (shortest) ways in which one could reach that corner starting from A.
This is a classic problem to illustrate the concept of counting, which is much more than use of ${}^nC_r$ and ${}^nP_r$
Since the objective is to reach B, one way to count is to work backwards from B
B can be reached from $x_{11}$ or $x_8$ (Both are mutually exclusive)
$\therefore$ Number of ways of reaching $x_{11}$, $n(x_{11}) = n(x_9)$, number of ways of reaching $x_9$
(Since there is only 1 shortest way to go from $x_9$ to $x_{11}$)
Similarly, $n(x_8) = n(x_9) + n(x_4)$
$n(x_9) = n(x_{10}) + n(x_5)$
$n(x_4) = {}^4C_1 = 4$ [From A to $x_4$]
$n(x_{10}) = n(x_6) = 2$ [From A to $x_6$]
$= n(x_5) = 3$ [From A to $x_5$]
$\Rightarrow n(x_9) = 5$, $n(x_4) = 4$, $n(x_8) = 9$
$\Rightarrow n$ (B) = 9 + 5 = 14

**Alternative Solution:**
One can also start directly from A itself and evaluate the number of ways as we progress towards B.
Here $x_1 = x_2 = x_3 = 1$ (shortest way) = $x_7$ and $x_{10} = x_6$ and $x_{11} = x_9$
$\therefore x_6 = x_1 + x_7 = 2$; $x_5 = x_2 + x_6 = 3$; $x_4 = x_5 + x_3 = 4$; $x_{10} = x_6 = 2$; $x_9 = x_5 + x_{10} = 5$ $x_8 = x_4 + x_9 = 9$ and number of ways to B = $x_8 + x_{11} = 9 + 5 = 14$. Ans: (14)

**21.** Though we do not know the distance PQ along the track, we can observe that the time interval that is relevant is from 9:00 a.m. to 10:30 a.m., within which Arjun and Bhim covered the entire track-length once, travelling in opposite directions. Also, later, Arjun took 75 minutes more than Bhim to complete one full track-length (and return to O).
Let the length of the track be L meters and the speeds of Arjun and Bhim be $p$ and $q$ m/s respectively.
Together, the two cover the entire track in 90 minutes
i.e., L = 90($p + q$) ------- (1)
Arjun takes 75 minutes more than Bhim to cover the entire track

i.e. $\dfrac{L}{p} = \dfrac{L}{q} + 75$ ------- (2)

Since L = 90($p + q$)

$\dfrac{90(p+q)}{p} = \dfrac{90(p+q)}{q} + 75$

$\Rightarrow \dfrac{q}{p} - \dfrac{p}{q} = \dfrac{5}{6}$ ------- (3)

Let $\dfrac{p}{q} = k$, i.e., Arjun's speed is $k$ times that of Bhim.

$\Rightarrow \dfrac{1}{k} - k = \dfrac{5}{6}$

$6k^2 + 5k - 6 = 0$

$\Rightarrow k = -\dfrac{3}{2}$ or $\dfrac{2}{3}$

Since $k$ is positive $k \neq -\dfrac{3}{2}$

$\Rightarrow k = \dfrac{2}{3}$ and $24k = 16$. Ans: (16)

**22.** If $p > q$, then step 2 swaps $p$ into $q$ and $q$ into $p$.
For example, if $p = 10$ and $q = 3$, then $r = p = 10$
$p = q = 3$
$q = r = 10$
$p = 3$; $q = 10$
In step 3, $q$ is subtracted by $p$ and $s$ is increased by 1, which gives the number of times $p$ is subtracted from $q$.
In step 4, when $p$ is greater than $q$, $s$ is given as output, which is number of times $p$ is subtracted from $q$, i.e. quotient, when 10 is divided by 3. Choice (C)

**23.** Initial sum of the 20 numbers in P = 20 × 20 = 400
Now, when $a_i$ is added from Q to P, average of the numbers in P becomes 20 + (2). When $a_2$ is added, average of P becomes 20 + (2 + 3) and so on
$\Rightarrow$ final average of the numbers of P i.e. when $a_{20}$ is added = 20 + (2 + 3 + ….21)

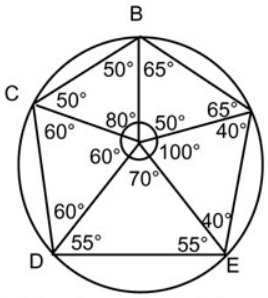
$= 20 + \left(\dfrac{21+2}{2}\right) \times 20 = 250$

Hence, the final sum of the 40 numbers in P
= 250 × 40 = 10,000
$\Rightarrow$ Sum of $a_1 + a_2 + a_3$ ……$a_{20}$ = 10,000 – 400 = 9,600

$\Rightarrow$ Average of $a_1, a_2, a_3 \ldots a_{20} = \dfrac{9{,}600}{20} = 480$

Alternatively, after we get the combined average as 250, and since both groups are equal in size, we can directly conclude that the average of the second group will be 250 + (250 – 20) = 480. Ans: (480)

**24.**

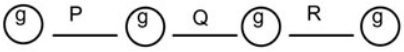



Since the total angle subtend at the centre is 360°, angle subtended by AE = 360° – (50° + 80° + 60° + 70°) = 100°.
We can see that the pentagon is divided into 5 isosceles triangles.
The least angle will be opposite to the central angles whose sum is greatest i.e., ∠DOE + ∠AOE.
In ΔDOE and Δ AOE,
∠DEA = ∠OED + ∠OEA

$= \dfrac{180° - \angle DOE}{2} + \dfrac{180° - \angle AOE}{2} = \dfrac{360° - (170°)}{2} = 95°.$

Choice (C)

**25.** Let us first arrange the order of P, Q and R




There are four gaps as shown.
The remaining two persons could have visited one after other, where we have to select one gap
$\Rightarrow {}^4C_1 \times 2!$ ways
If they did not visit one after other, we have to select two gaps.
Number of ways = ${}^4C_2 \times 2!$
∴ Total number of ways = $4 \times 2 + 6 \times 2 = 20$

**Alternative Solution:**

The number of ways in which 5 people can visit the party is 5! = 120.
Three people P, Q, R (considering only their relative order of arrival) can visit the party in 3! = 6 ways
Of the 6 ways only in one way they visit the party in the order P, Q, R (given).
Thus the required number of ways

$= 120 \times \dfrac{1}{6} = 20$ ways. Choice (C)

**Solutions for questions 26 and 27:**

Given that
$x^3 y^2 = 864$ ---- (1) and

$\dfrac{x^2}{y} + xy^3 = 66$ ----- (2)

Let $\dfrac{x^2}{y} = A$ and $xy^3 = B$

$\Rightarrow A + B = 66$ and $AB = x^3y^2 = 864$
$\Rightarrow A(66 - A) = 864$
$\Rightarrow A = 18$ or $48$
$\Rightarrow B = 48$ or $18$

Case I : When $A = \dfrac{x^2}{y} = 18$ and $B = xy^3 = 48$

$y = \dfrac{x^2}{18} \Rightarrow B = \dfrac{x(x^2)^3}{18^3} = 48$

$\Rightarrow x^7 = 48 \times 18^3$, i.e., $x = \sqrt[7]{6^7} = 6$ and $y = 2$

∴We get one real value for $x$ and correspondingly one real value for $y$, i.e., one ordered pair $(x, y)$.

Case II : $A = \dfrac{x^2}{y} = 48$ and $B = xy^3 = 18$

$\Rightarrow B = \dfrac{x(x^6)}{48^3} = 18$

$\Rightarrow x^7 = 18 \times 48^3 = 2^{13} \times 3^5$

$\Rightarrow x = \sqrt[7]{2^{13} \times 3^5} = 2^{13/7} \times 3^{5/7}$ and $y = 2^{-2/7} \times 3^{2/7}$.

Here also we get one real value for $(x, y)$.

**26.** Hence we have two ordered pairs $(x, y)$ satisfying the given equations. Choice (A)

**27.** Choice (A): $x^2y^4$ is not integer when $x = 2^{13/7} \times 3^{5/7}$ and $y = 2^{-2/7} \times 3^{3/7}$.

Choice (B): $\dfrac{x^3}{y^5}$ is not an integer when x = 6 and y = 2.

Choice (C): For both the values of (x, y), $x^4y^5$ is an integer.

∴ $x^4y^5$ definitely is an integer. Choice (C)

**Solutions for questions 28 to 34:**

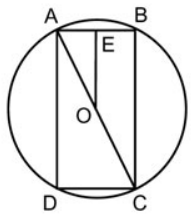
**28.** Let the first sum be P and the rate of interest on it be $r$ p.a. (or 100 $r$% p.a.)
CI on P for 2 years = P $(2r + r^2)$

SI on 8.5 P for 6 months = P(8.5) $\left(\dfrac{1}{2}\right)\left(\dfrac{r}{2}\right)$

$\therefore 2r + r^2 = \dfrac{17r}{8} \Rightarrow r^2 = \dfrac{r}{8}$

$\Rightarrow r = \dfrac{1}{8} \Rightarrow \dfrac{100}{8}\% = 12.5\%$ Choice (A)

**29.** Let the radius of the sphere be 'R' units.
Consider the following diagram.




If maximum possible material should utilized, then the cylinder must be carved out as shown in the figure (from the front view).
Let ABCD be the cylinder
AO = R,
$\Rightarrow$ AB = R
Let E be the mid-point of AB.

$\Rightarrow AE = \dfrac{R}{2}$

$EO = \sqrt{R^2 - \left(\dfrac{R}{2}\right)^2} = \dfrac{\sqrt{3}R}{2}$ units

∴The height of the cylinder is $2EO = \sqrt{3}R$ units.

∴The required percentage

$= \dfrac{\text{Volume of the sphere - Volume of the cylinder}}{\text{Volume of the sphere}} \times 100$

$$= \frac{\frac{4}{3}\pi R^3 - \pi\left(\frac{R}{2}\right)^2\left(\sqrt{3}R\right)}{\frac{4}{3}\pi R^3} \times 100$$

$$= \frac{\frac{4}{3} - \frac{\sqrt{3}}{4}}{\frac{4}{3}} \times 100 = 67.5\%$$ Choice (B)

**30.** In the following table, every row represents the status of the chairs after every new arrival. Also, $P_1$, $P_2$, $P_3$, ……. are the passengers who sit in the row.
'✓' indicates occupied
'_' indicates empty

| No. of Chairs occupied | S. No. of Chairs | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | …. |
| 1 | ✓$P_1$ | _ | _ | _ | _ | _ | _ | _ | …. |
| 2 | ✓ $P_1$ | _ | ✓ $P_2$ | _ | _ | _ | _ | _ | …. |
| 2 | ✓ $P_1$ | ✓ $P_3$ | _ | _ | _ | _ | _ | _ | …. |
| 3 | ✓ $P_1$ | ✓ $P_3$ | _ | ✓ $P_4$ | _ | _ | _ | _ | …. |
| 3 | ✓ $P_1$ | ✓ $P_3$ | ✓ $P_5$ | _ | _ | _ | _ | _ | …. |
| 4 | ✓ $P_1$ | ✓ $P_3$ | ✓ $P_3$ | _ | ✓ $P_6$ | _ | _ | _ | …. |
| 4 | ✓ $P_1$ | ✓ $P_3$ | ✓ $P_3$ | ✓ $P_7$ | _ | _ | _ | _ | …. |

In this manner, all chairs except the 43rd (i.e. 43 – 1 = 42 chairs) can be occupied simultaneously. Ans: (42)

**31.** Because of the symmetry of the figure (for counting purpose), any of the eight small triangles (i.e. triangle of the type DOF, FOC, …..) can be observed to appear in the same number of triangles. For examples, consider the triangle DOF. It is a part of ΔDOC, ΔADC, ΔBDC and ΔDOF itself i.e. it is a part of 4 triangles. Similarly each of the remaining seven triangles is a part of exactly four triangles. So, the sum of the areas of all the triangles that can observed in the figure is equal to the four times the sum of all the small triangles (i.e., of the type DOF). But the sum of these eight triangles is equal to the area of the quadrilateral ABCD.
∴Sum of the areas of all the triangles that can be observed in the figure = 4(Area of the quadrilateral ABCD) = 4(108) = 432 Ans: (432)

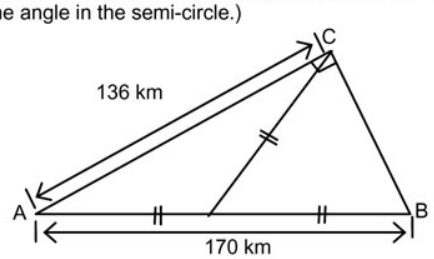
**32.** If the cube of a number ends with a 4, then the number also ends with a 4. Let (10K + 4) represent a three-digit number such that $(10K + 4)^3$ ends with 44.

Since (10K + 4) is a three-digit number, K is a natural number and $10 \le K \le 99$.

Now in $(10K + 4)^3$ i.e., in $1000K^3 + 1200K^2 + 480K + 64$, the last two digits are decided by the last two terms, i.e, 480K + 64. The units digit is known to be 4. The ten's digit of $(10K + 4)^3$ is the ten's digit of 480K + 64 or the units digit of 48K + 6 i.e the units digit of 8K + 6.

Now if the unit's digit of 8K + 6 ends in 4, then K must end in either 1 or 6.
So K can be 11, 16, 21, 26 ----91, 96, i.e., a total of 18 values.
Hence, a total of 18 three-digit numbers exist such that their cubes end in 44 Ans: (18)

**33.** From the given information, it is implied that the three cars make a right-angled triangle (with their distances from the starting point being the radii of a circle and the distance between the first two cars the diameter. ∠ACB = 90°, being the angle in the semi-circle.)




Now, $CB = \sqrt{170^2 - 136^2} = 102$ km. Ans: (102)

**34.** Let the time taken by Ashok to complete the job be x hours.

The standard time would be $\frac{3x}{4}$ hours.

Let y be the standard rate of pay.
∴ Total work = standard time × standard rate of work

$$= \frac{3x}{4}y = \left(\frac{3}{4}y\right)x$$

∴ Ashok's rate of work = $\frac{3}{4}y$

∴ Ashok's actual rate of work was 25% less than the standard rate.

$$\therefore \text{His actual hourly wage} = 6 - \left[\frac{\frac{25}{5}\times 8}{100}\times 6\right] = 3.6$$

Since he took exactly three hours, he was paid
3.6 × 3 = ₹10.80 Choice (C)

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