T.I.M.E.
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(Key and Solutions for AIMCAT1821)

Key

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1. C	8. A	15. 6	22. B	29. 21435
2. A	9. B	16. D	23. C	30. 5
3. B	10. C	17. D	24. B	31. 235
4. D	11. D	18. C	25. 24153	32. 4
5. C	12. D	19. B	26. 35241	33. 3
6. B	13. C	20. D	27. 43251	34. 2
7. B	14. B	21. B	28. 51423	

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5. D	12. 4	19. D	26. B	
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3. B	10. A	17. C	24. C	31. B
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6. B	13. 2976	20. D	27. C	34. C
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Solutions

SECTION – I

Solutions for questions 1 to 6:

Number of words and Explanatory notes for RC:

Number of words: 608

1. Like the other arts, literature is involved with ends beyond itself.
Option A: Choice A talks about 'life' not being the same after we have read a book. The last sentence of the passage talks about a 'good book'. Choice A is incomplete and does not capture the essence of the last sentence of the passage in its entirety.
Option B: Choice B is out of context. The third sentence of the last para is restated here. Choice B does not refer to the last sentence of the passage.
Option C: Literature is a criticism of life. It may be in active relationship with our sense of ourselves, with our sense of life in time and life by values. Like other arts, **literature is involved with ends beyond itself.** So we can say that good literature or a good book can help extend our knowledge or human experience. Hence choice C is true.
Option D: The word 'only' in choice D makes it extreme. Choice D is a distortion and runs tangent to the point of view in the last few sentences of the last paragraph.
Choice (C)

2. Refer to para 2.
Option A: We do not talk quite so easily about all farm labourers or even about 'all Russians' after we have read Hardy or Turgenev. It is implicitly inviting us to widen and deepen our knowledge of ourselves and of our relations with others, to realize that life is more this and more that than we had been willing to think. Hence choice A is true.
Option B: Choice B does not bring in the role of literature. The word 'prove' in choice B renders it incorrect.
Option C: "We do not talk quite so easily ....." in the second para does not imply that the role of literature is "to talk more about things....". Literature has other important roles. It invites us to remain responsive and alert and invites us to widen and deepen our knowledge of ourselves and of our relations with others .... Hence choice C is not the answer. It pales in comparison with choice A.
Option D: Choice D forms a part of the third para. It is a secondary point of view. It is not related to the question statement mentioned in the second para of the passage.
Choice (A)

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3. Most of us are constantly tending to narrow our focus, to ignore embarrassing qualifications and complexities, make all this into merely a backcloth (backdrop) to the stage on which our egos do act comfortably. Literature can help to bring us up short, to stop the moulds from setting firm.
Option A: Choice A may be true otherwise but it is not relevant to the question.
Option B: Refer to the last sentence of para 1. The writer contrasts a 3D human whose experiences are ever widening to a fixed 2 D human. Choice B comes closest to this description, that a human is not an uncomplicated, reduced being. This thought is carried forward in the lines of the next para as well.
Option C: It has been mentioned in para 4 of the passage that a society without a literature has that much less chance of embodying within its temper and so within its organizations sometimes of the fullness of human experience. ... We may know some things only by approaching them metaphorically, as 'dramatic play'. Choice C is not the reason that the author uses the analogy of a three dimensional human in the first para.
Option D: The word 'only' in choice D renders it out of scope. Choice D is not specific to the question. Discussion about "the moral will" in the context of literature takes place in the penultimate para of the passage. Choice (B)

4. Literature can make us sense more adequately the fullness, the weight, the inter relations and the demands of human experience and the possibilities of order.
Option A: Works of literature, properly read, give us the opportunity to extend our imaginative grasp of human experience; if we will to act well thereafter we may be able to do so with greater flexibility and insight. Hence choice A is a characteristic of literature and is not the answer.
Option B: Literature can be morally educative. It can guide the moral will in so far as its illuminations depreciate certain modes of conduct and, conversely, reinforce others. But it cannot direct the moral will, be 'the soul of all (our) moral being.' So choice B is a characteristic of literature and is not the answer.
Option C: Literature is 'a criticism of life' which must itself be judged. Therefore choice C is a characteristic of literature and is not the answer.
Option D: Choice D is not true. We can only understand that criticism and make our own judgement on it if we first – in a sense – suspend the will, if we attend to the literature as itself, as if it were an autonomous object, and let it work in its own way. Choice D is the answer. Choice (D)

5. Option A: Literature can make us sense more adequately the fullness, the weight, the inter relations and the demands of human experience and the possibilities of order. It can make us feel all this, but not necessarily act on this. We can see and do otherwise, always. But we are not then acting **quite so much out of blindness and inarticulateness**; we are selfishly or fearfully or willfully trying to short circuit what we know underneath to be more nearly the true state of things. Since the author says that we are not acting out of blindness, we can say that the constraints on the moral will do not include ignorance but other limitations. Hence choice A is incorrect.
Option B: Choice B is not hinted in the passage.
Option C: It can guide the moral will in so far as its illuminations depreciate certain modes of conduct and, conversely, reinforce others. But it cannot direct the moral will, be 'the soul of all (our) moral being.' Hence choice C is the answer.
Option D: The first part of choice D is out of scope. The second part of choice D is incorrect. Literature is not independent of the moral will. Literature can be morally educative Choice (C)

6. Option A: The first sentence of para 2 states that "Literature is all the time implicitly inviting us to remain responsive and alert and to extend our humanity." While it is true that literature provides a criticism of life, no "ways" as in choice A have been discussed in the passage.
Option B: The first sentence of para 5 states that literature "Can make us sense ..... human experience". The first sentence of para 2 states that "Literature is all the time implicitly inviting us to remain responsive and alert and to extend our humanity." Choice B best represents this picture.
Option C: Choice C is more on the lines of self-knowledge, and does not focus on the human experience and how we relate to others, "interrelations". Hence choice C is not the answer.
Option D: Choice D does not mention any relevant ends at all. Choice (B)

Solutions for questions 7 to 12:

Number of words and Explanatory notes for RC:

Number of words: 576

7. According to the author, "in order to determine what leads states to perceive others as threats one needs to examine cases in which this perception is absent as well as cases in which it is present".
Option A: He mentions that when one looks at only the cases in which the perception is present, "the factors one locates may be necessary conditions". Hence, one may be able to identify the necessary conditions when one looks at the cases in which the perception of threat is present. Hence, this is not the correct answer.
Option B: According to the author, by studying only those cases in which there is a perceived threat, "the factors one locates may be necessary conditions but may not separate the circumstances that lead to the feeling of menace from those that do not". Hence, by studying the cases where there is no perceived threat, one may be able to "separate the circumstances that lead to the feeling of menace from those that do not". Hence, this is the correct answer.
Option C: The author mentions that one can separate the circumstances that will lead to the perception of threat from the ones that do not. However, in the first paragraph, the author talks about the perception of threat from an academic perspective (as he discusses how psychological theories are better at studying this perception) and his objective is not necessarily mitigation of conflict between states. Hence, this option is incorrect.
Option D: The author does mention that by studying the cases in which there is a perception of threat, one may locate the factors which are necessary conditions. Hence, it is incorrect to say that there will be no meaningful insights.
Hence, the correct answer is option B. Choice (B)

8. The author discusses the given statement in the last paragraph of the passage.
Option A: According to the author, "They take the pattern they think they observe and project it forward into the future". Even when the immediate stakes seem smaller, "more far-reaching goals will be imputed". Hence, this is the reason why the author states that small incidents may have larger implications.
Option B: The author mentions that statesmen may consider external environment as a proxy for inferring the intentions of the state (in the penultimate paragraph). But this is not relevant to this question.
Option C: While the author mentions that "When high costs are incurred, observers will assume that major objectives must be being sought", these high costs, by themselves, are not what result in small incidents having large implications. Small incidents usually do not incur high costs and hence, this is not relevant in this context.
Option D: The author does not imply that statesmen are paranoid about other states looking to harm them.
Hence, the correct answer is option A. Choice (A)

9. The author talks about judging the intentions of other states in the penultimate paragraph of the passage. He mentions three kinds of variables in this paragraph – external

environment, past behaviour and goals, beliefs, and personalities of their opposite numbers.
The capability of the state is not indicative of the intentions of the state as the author explains in the second paragraph of the passage. He mentions that even though the US is capable of destroying Britain, France and Germany, these states do not perceive the US to be a threat. He states that capabilities "do not determine the image that is formed". Further, in the next paragraph, when he discusses statesmen considering "objective situation" of a state to judge the intentions of the other states, he mentions that the statesmen can do so if they believe that the "external environment is the most important source" of the state's behaviour. We can infer from this that the capability of a state is not part of its "external environment" and hence, this will not be part of assessing the "objective situation" of the state.
Hence, only I and II are appropriate. Choice (B)

10. The author talks about the capabilities of the state being an "appropriate way for states to judge whether others are a threat".
Option A: The capability of the state is not indicative of its intentions. The author presents the examples of U.S., Britain and France. Hence, this is not the correct answer.
Option B: The author provides the example of Soviet Union and US. According to the author, "in the mid and late 1940s the United States came to see the Soviet Union as hostile even while realizing that it was weak". Hence, it is not necessary for a state to be stronger to be perceived as a threat.
Option C: The capability of a state to harm others is not indicative of the threat level between states. In the example of US and Britain, the author provides an instance in which, even though a state is capable of destroying another state, it is not perceived as a threat. In the example of the US and the Soviet, he provides an instance in which, even though a state is weaker (or less capable), it is perceived as threat by the other state. Further, the author talks about how statesmen use other information to infer whether a state is a threat or not. Hence, this is true and is the correct answer.
Option D: This option talks about the worst case analysis mentioned in the passage. But the author mentions that "this does not seem to be the case". Hence, this is not the correct answer.
Therefore, the correct answer is option C. Choice (C)

11. From the given information, we can infer that the statesman considers the past behaviour of a state is critical in judging the intentions of other states.
Option A and C: The statesman does not consider the external environment but he considers that past behaviour is important. Hence, this option is incorrect.
Option B: We cannot infer whether the statesman consider the national character of the state (which determines its past behaviour) to be an indication of the capability of the state. The statesman would have judged its intentions based on this. Hence, this is not the correct answer.
Option D: The statesman would most probably have believed that the national character is important for judging the intentions of the state. Hence, this is the correct answer. Choice (D)

12. The first paragraph of the passage talks about Deterrence theory and the question that it leaves unanswered.
Option A: The author mentions that Deterrence theory "takes the perception of threat for granted". But he does not mention that not explaining the circumstances in which a state perceives threat is a shortcoming of the theory. According to him, "This is a legitimate approach – any theory has to start from somewhere".
Option B: The author mentions only one question that the Deterrence theory does not answer. Hence, this option cannot be inferred from the passage.
Option C: Deterrence theory prescribes and explains "the policies that are and should be adopted". Psychological theories are better suited for answering" the question of the circumstances under which states see others as menaces to their security". Hence, this option is incorrect.
Option D: The author opines that any theory has to start from some place. Deterrence theory has defined its objectives but it fails to answer a question which it is, according to the author, not best suited to do (as psychological theories are better at answering that question). Hence, the scope of the theory does not include the study of circumstances which lead to perception of threat. Therefore, this is the correct answer.
Choice (D)

Solutions for questions 13 to 18:

Number of words and Explanatory notes for RC:

Number of words: 751

13. Refer to the last para of the passage.
Option A: Choice A is incorrect. The author does not talk about rejecting the possibility of someone being abducted by aliens. When someone claims to have been abducted by aliens, we may find it probable that the person has travelled no farther than the confines of his or her own mind. But we need not reject the story as mere fantasy.
Option B: In the last para, the author says that acceptance, belief, rejection can all lead us astray. The way of acceptance, the way of belief and the way of rejection are inadequate in understanding the unknown. So choice B is not true.
Option C: Perhaps the surest road to understanding is the way of experience, which begins by seeing each story as an event that has actually happened. This does not mean we accept it without question .... But we need not reject the story as mere fantasy. Hence choice C is the answer.
Option D: The unknown is always with us – and always has been. But choice D is not the conclusion of the author.
Choice (C)

14. The ancient Greeks recorded ghost stories; the Romans told of haunted houses. There is not a culture in the world that does not possess some tradition of communication between the living and the dead.
Option A: The lines in the passage imply that "Every culture in the world possesses some tradition of communication between the living and the dead." So "Not every culture ..... **same** tradition of communication" in choice A is not true. Choice A is a distortion.
Option B: Walking the ordinary path of everyday existence, we may sometimes forget that on either side of that path lies the unpredictable and the unexplained. Every culture in the world possesses some tradition of communication between the living and the dead. Hence choice B is correct.
Option C: The renowned American philosopher William James wrote in 1897, "The phenomena are there, lying broadcast over the surface of history .... There was never a time when these things were not reported just as abundantly as now." But choice C is not the answer for the question
Option D: There was never a time when these things were not reported just as abundantly as now. Choice D is not the reason for the question. Choice (B)

15. (1) The simplest response is the way of acceptance. ... The Dreaming spirits not only created their world, but also remain very much a part of their everyday lives. Hence (1) is true and is not the answer.
(2) But in some cultures there emerge individuals who believe they know better and proclaim that thunder and lightning are signs of divine displeasure ... This is the way of belief, which has dominated response to the uncanny for much of recorded history. Hence (2) is true and is not the answer.
(3) Scientific learning has been mentioned as a response. Para 6 (This was the Age of Enlightenment, when it seemed only a matter of time before science, which

had solved so many mysteries, would explain those that remained) and the last line of the passage indicate that reference to scientific learning has also been a response. So (3) is true and is not the answer.

(4) The inevitable reaction to the way of belief is the way of rejection. Hence (4) is true and is not the answer.

(5) Acceptance, belief, rejection can all lead us astray. Perhaps the surest road to understanding is the way of experience, which begins by seeing each story as an event that has actually happened. Hence (5) is true and is not the answer.

(6) Experimentation has not been mentioned in the passage as a response towards the supernatural beliefs and is the answer. Ans: (6)

16. Whenever experiences occur on the margins of reality, people wonder how best to fit them into the pattern of their daily lives.

Options A & B: Choices A and B are incorrect and do not explain the difference between acceptance and belief as explained in the passage. It has only been mentioned in the passage: Throughout the Dark Ages, all thinking was controlled by the prevailing religious establishment. In the East it was codified into rigid structures of belief; in Europe every happening.

Option C: The comparison in the first part of Choice C is incorrect. People do not accept the unnatural events to be **equivalent to** thunder and lightning. The unnatural events remain very much a part of their everyday lives, as much a part of the natural order as thunder and lightning. In some cultures, people proclaim that thunder and lightning are signs of divine displeasure ..... this is the way of belief. Hence choice C is not true.

Option D: For Australian Aboriginal people, for instance, the Dreaming spirits not only created their world, but also remain very much a part of their everyday lives, as much a part of the natural order as thunder and lightning. But in some cultures there emerge individuals who believe they know better than their fellows, who proclaim that thunder and lightning are signs of divine displeasure, and interpret dreams and visions as glimpses of a hidden order that they alone – as priests or magicians – have the skill to interpret. This is the way of belief. Hence choice D is correct.

Choice (D)

17. Option A: In their role as society's watchdogs, scientists dismissed ghosts as figments of the imagination .... Hence choice A is correct and is not the answer.

Option B: Walter Franklin Prince of the Boston Society for Psychical Research suggested that a kind of enchantment surrounds the uncanny and causes otherwise intelligent people to abandon customary standards of judgment, brushing aside the evidence in a way they would never consider doing in other matters. Other intelligent people like Professor Henry Sidgwick have also been mentioned in the passage as to have brushed aside the evidence of unnatural events. Choice B is not the answer.

Option C: Choice C is also an example of rejection as per the passage. By 1768 English preacher John Wesley could note that "the English in general, and indeed most of the men of learning in Europe, have given up all accounts of witches and apparitions as mere old wives 'fables.'" Choice C is not the answer.

Option D: If witnesses of supernatural events eventually led to people believing in them, then rejection of beliefs would not be possible. Hence choice D is the answer.

Choice (D)

18. The nineteenth-century German physiologist Herman von Helmholtz commented: "Neither the testimony of all the Fellows of the Royal Society, nor the evidence of my own senses, could lead me to believe in the transmission of thoughts from one person to another independently of the recognized channels of sensation. It is clearly impossible."

Option A: Helmholtz remarks that he would not believe any testimony on the existence of telepathy. Hence choice A is not the answer.

Option B: Choice B cannot be inferred from Herman's remark. Other men of science declared that since tables cannot spin on their own, when they do spin it can only be due to muscular pressure exerted by the sitters.

Option C: Transmission of thoughts from one person to another, independently of the recognized channels of sensation, is impossible. Hence choice C is the answer. Herman's comment leads to the inference that he asserts the existence of recognized channels for the transmission of thoughts from one person to another.

Option D: Choice D with the word 'never' is out of scope and is not the answer. Choice (C)

Solutions for questions 19 to 21:

Number of words and Explanatory notes for RC:

Number of words: 463

19. According to the author, "memories triggered by smells can be more emotional, as well as more detailed, than memories not related to smells".

Option A: The reason for this is given in the next paragraph. The author states that "odor molecules set brain cells dancing within a region known as the amygdala" and "the other senses, such as taste or touch, get routed through other parts of the brain before reaching the amygdala". However, he does not mention anything about the number of brain cells that will be affected. Hence, this is not the correct answer.

Option B: The passage talks about a "direct link between odors and the amygdala", which is not the case with other senses. Hence, this is the correct answer.

Option C: Towards the end of the passage, Gottfried mentions that "You can reawaken that memory from any one of the sensory triggers ... maybe the smell of the sun lotion, or a particular sound from that day, or the sight of a rock formation." Hence, this option is incorrect.

Option D: The author does not compare the activity of the olfactory part of the brain with other parts when talking about why the memories triggered by smells are more emotional. Hence, this is not the correct answer.

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

20. In the latter part of the experiment conducted by the neuroscientists at University College London, when the volunteers were shown a photo of the duck, their olfactory cortex lit up.

Options A and C: Since the volunteers were shown an image, they were provided with a visual stimulus and not an olfactory stimulus. Hence, both these options are incorrect as they talk about an olfactory stimulus.

Option B: Visual stimulus (i.e., the photo of the duck) resulted in the olfactory cortex being lit up. But the effect on the auditory part of the brain is not mentioned in the passage. Hence, this option is incorrect.

Option D: The visual stimulus affected the olfactory cortex in the experiment and hence, this is the correct answer.

Choice (D)

21. Gottfried mentions how memories spread across the brain has some advantages. He provides an example in which a memory can be reawakened with any of the sensory triggers.

Option A: Gottfried does not talk about how easy or difficult it is to forget a memory when it is spread around the brain. Hence, this option is incorrect.

Option B: Gottfried talks about how "the smell of the sun lotion, or a particular sound from that day, or the sight of a rock formation" can reawaken a memory. Hence, any scent, sight or sound associated with a memory can help us recollect the details of the memory.

Option C: While we can infer from the passage that olfactory stimulus will help recollect more details of a memory, we cannot infer from the passage whether the memory being spread around the brain is responsible for this. Hence, this cannot be the correct answer.

Option D: Gottfried does not talk about the activity in various parts of the brain. Hence, this option is also incorrect.
Therefore, the correct answer is option B. Choice (B)

Solutions for questions 22 to 24:

Number of words and Explanatory notes for RC:

Number of words: 439

22. The author mentions that electric cars will become more commonplace and talks about how this will change the world in the penultimate paragraph of the passage.
Option A: The author mentions that electric cars will "become a mainstream status symbol and it is the buyers of internal combustion vehicles who will feel like weird outsiders". However, in the last paragraph, he mentions that "If cars do come to be valued for their usefulness, not as means of ostentation, the motor car would become only a status symbol for the rich, as useless, if still as loved, as the private horse now is". From this, we can infer this choice to be false.
Option B: The author mentions that "If those trends continue, the private car might disappear altogether, replaced by a network of hired autonomous vehicles, at least within cities". The autonomous vehicles refer to vehicles which can drive themselves without any human intervention. Hence, this is the correct answer.
Option C: This option represents the current state of affairs. The author mentions that "long journeys are still fraught with anxiety". But he feels that this will soon be addressed. Hence, this is not the correct answer.
Option D: The author does mention that "The electric car will become a mainstream status symbol and it is the buyers of internal combustion vehicles who will feel like weird outsiders". However, we cannot call them two halves if, according to the author, electric will become much more prevalent than motor cars. Further, we cannot infer from the paragraph that the people will be polarized regarding motor cars and electric cars. Hence, this is not the correct answer.
Therefore, the correct answer is option B. Choice (B)

23. The author mentions that "All-electric traffic will be faster, reversing the trend of the last century".
Option A: The author does not mention that people prefer to buy powerful and faster cars. Further, since the electric cars will be faster, the trend will not be reversed, even if this were true. Hence, this is not the correct answer.
Option B: Cars which do not require drivers are mentioned by the author in the next sentence and is not a trend that was seen in the last century which will be reversed. Hence, this is not the correct answer.
Option C: The author mentions that the traffic will become faster reversing the trend of the last century. We can infer from this that the trend that will be reversed is the vehicles becoming slower in traffic. Hence, this is the correct answer.
Option D: The increase in the electric cars on road is not a trend that will be reversed. Hence, this is not the correct answer.
Therefore, the correct answer is option C. Choice (C)

24. The author talks about the similarity between motor cars and horses in the last paragraph.
Option A: The author believes that motor cars might become only a desire of the affluent, as horses are now. But he does not state that they served no practical purpose. According to the author, they were useful but they might not be in the future. Hence, this option is incorrect.
Option B: According to the author, "Car ownership was for much of the world a mark of status in the way that owning a horse made you a knight". Hence, we can say that they were both considered prestigious by the society.
Option C: According to the author, cars embody "freedom, autonomy and power" for not just Bruce Springsteen but also for others. We can infer from the passage that horses are symbolic of status. But we cannot infer from the passage whether horses also embodied freedom, autonomy and power. Hence, this is not the correct answer.
Option D: The author does not compare how much the motor cars and horses were loved by their owners. He predicts that the motor car will be considered, in the furure, as the horse is considered now. Hence, this is not the correct answer.
Therefore, the correct answer is option B. Choice (B)

Solutions for questions 25 to 29:

25. On a careful reading of the sentences, it can be observed that sentence 2 is a general sentence that begins the paragraph. It has a number of proper nouns and introduces a geographical location: Simandou. Sentences 2 and 4 form a mandatory pair. "El Dorado of iron ore" in sentence 2 links with "world's largest known untapped deposit of the stuff, with enough ore" in sentence 4. Sentence 4 is followed by sentence 1. "enough ore to sustain annual production of 200 m tonne" in sentence 4 links with "the ore there has unusually high iron content" in sentence 1. Sentence 5 follows sentence 1 with the contrast conjunction 'but'. The sentence highlights some negative points (allegations of corruption, expropriation and corporate espionage) about Simandou. Sentence 3 is a standalone sentence which is best placed at the end of the paragraph. "An emblematic tragedy" and the saga of Simandou" in sentence 3 links with "mired in allegations of corruption, expropriation and corporate espionage" in sentence 5. "this situation" in sentence 3 points to "allegations of corruption, expropriation and corporate espionage" in sentence 5. So, 24153. 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. Sentence 3 is followed by sentence 5. "<u>land between the rivers</u>" in sentence 3 is contrasted by "though, the lines which divide the country, <u>not those which circumscribe it</u>, matter most" in sentence 5. Sentence 2 (People **are emerging** from the deepest of <u>traumas</u>) follows sentence 5 (**Today**, ... <u>divide the country</u>). Sentence 4 (also already enjoy .....) provides another positive point about life in Iraq and follows sentence 2. "also already enjoy peace and a fair, or rising, degree of prosperity" in sentence 4 points to "a world of possibilities" mentioned earlier in sentence 2. So, 3524. Sentence 1 concludes the para with the contrast conjunction 'though'. "the heart of the country is trapped in ethnic and sectarian strife, vicious political factionalism and foreign meddling" in sentence 1 contrasts "world of possibilities" in sentence 1 and "enjoy peace and a fair, or rising, degree of prosperity" in sentence 4. "trapped in ethnic and sectarian strife, vicious political factionalism and foreign meddling" in sentence 1 points to " divide the country" mentioned earlier in sentence 5. So, 35241. Ans: (35241)

27. On a careful reading of the sentences, it can be observed that sentence 4 is a general sentence that begins the paragraph. It introduces the topic: Printing has come a long way since Johannes Gutenberg ..... The remaining sentences can be arranged keeping the chronological order in mind. Sentence 4 is followed by sentence 3 which mentions other processes 'lithography' and 'screen printing'. Sentence 3 is followed by sentence 2. Laser and inkjet printers arrived in the 1970s. Sentence 5 follows sentence 2. "laser and inkjet printers arrived" in sentence 2 is followed by "3D printers emerged". So, 4325. Sentence 1 provides an item on the wishlist: a machine that could also print the electronics that go into devices. Sentence 1 concludes the para. Ans: (43251)

28. On a careful reading of the sentences, it can be observed that sentence 5 is a general sentence that begins the paragraph. Sinterklaas is celebrated on the country's most important children's holiday. It can be inferred that

sentence 4 which has the words "The problem" (which is negative in tone) cannot be placed immediately after sentence 5 even though sentence 4 has a reference to "the bearded St. Nicholas ("Sinterklaas")". Sentence 1 (But ..... slugfest of racial politics) has to precede sentence 4. So sentence 5 is followed by sentence 1. The pronoun 'it' in sentence 1 refers to the Dutch festival of Sinterklaas. "slugfest of racial politics" in sentence 1 is followed by "figure of Zwarte Piet, an impish clown with a black face who accompanies the bearded St. Nicholas" in sentence 4. "But it is turning" in sentence 1 links with "The problem is" in sentence 4. Sentence 4 is followed by sentence 2. "an impish clown with a black face who accompanies the bearded St. Nicholas" in sentence 4 is linked with "The character" in sentence 2. Also "Moorish slaves" in sentence 2 points to "slugfest of racial politics" mentioned earlier in sentence 1. Sentence 2 is followed by sentence 3. "many Dutch with African ancestry find it offensive" in sentence 2 links with "Most white Dutch fail to see the problem" in sentence 3. So, 51423. Ans: (51423)

29. On a careful reading of the sentences, it can be observed that sentence 2 is a general sentence that begins the paragraph. It has many proper nouns and proper adjectives and establishes the background or the topic of the argument: rising populations would inevitably exhaust natural resources, sending prices soaring. Sentences 2 and 1 form a mandatory pair. "rising prices should mitigate the squeeze by calling forth more supply" in sentence 1 is an argument by economists that contrasts the biologist Paul Ehrlich's argument "rising populations would inevitably exhaust natural resources, sending prices soaring" in sentence 1. Sentence 1 is followed by sentence 4. "That pitted him against economists" in sentence 1 links with "In a 1980 wager Julian Simon, an economist, bet Mr. Ehrlich..." in sentence 4. Sentence 4 is followed by sentence 3. "Julian Simon, an economist, bet Mr. Ehrlich" in sentence 4 is linked with "He won" in sentence 3. "commodity prices would be lower a decade later." in sentence 4 links with "effects of rising prices in the 1970s showed up in energy conservation and more oil exploration" in sentence 3. Sentence 3 is followed by sentence 5. "old argument that price pressure and shortage of resources will inevitably be a permanent feature of our lives" in sentence 5 contrasts "energy conservation and more oil exploration" in sentence 3. Sentence 5 concludes the para and mirrors the introduction. "old argument" in sentence 5 points to the argument of Paul Ehrlich in sentence 2. "price pressure and shortage of resources will **inevitably** be a permanent feature of our lives" in sentence 5 parallels "rising populations would **inevitably** exhaust natural resources" in the introduction sentence 2. So, 21435. Ans: (21435)

Solutions for questions 30 and 31:

30. Part (1) should have: For almost a generation, ... "For a generation almost ...." is incorrect, unless written as "For a generation, almost, ..."
Part (2) talks about a debate over a question. "consider to have settled" is incorrect. The part should have: "consider to have been settled".
In part (3), the noun 'question' needs to be preceded with the article 'the'. The part should read: The question is this:
Part (4) should have "obvious answer" not "answer obvious", and "ends up" not "ends at" (ends up playing at the professional level).
Part (5) is error-free. Ans: (5)

31. Part (1): "launched off" in part (1) is incorrect. The part should have: The Kepler telescope was launched **into** space in 2009 ....
Part (2) is error-free.
Part (3) is error-free.
Part (4): "whetted up" is incorrect. The part should have 'whetted' and not 'whetted up'. (It also whetted planet-hunters appetities.)
Part (5) is error-free. Ans: (235)

Solutions for questions 32 to 34:

32. On a careful reading of the sentences, it can be observed that sentence 3 is a general sentence that begins the paragraph. It introduces the background: To be "between styles" or "between subcults" is a life-crisis .... People of the future spend more time searching for styles. Sentence 3 is followed by sentence 1. "The people of the future" in sentence 3 links with "the future man or super-industrial man" in sentence 1. "searching for styles" in sentence 3 links with "altering his identity as he goes" in sentence 1. ""between styles" or "between subcults" is a life-crisis" in sentence 3 links with "world of colliding subcults" in sentence 1. Sentence 1 is followed by sentence 3. "private trajectory" in sentence 1 links with "this trajectory" in sentence 5. Sentence 5 is followed by sentence 2. "not simply movement from one economic class to another, but from one tribal grouping to another" in sentence 5 links with "Restless movement from subcult to ephemeral subcult" in sentence 2. "This trajectory" in sentence 5 points to "the arc of his life" in sentence 2. So, 3152. Sentence 4 is the odd sentence out as it is too general to be grouped with the remaining sentences in the paragraph. Ans: (4)

33. 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: Rice paddies are built ... Sentence 2 is followed by sentence 5. "Rice paddies are built" in sentence 2 links with "That's true. Rice fields are carved ....." in sentence 5. Sentence 1 continues as it provides other details of a rice paddy. a complex system of dikes has to be built for irrigation of the rice paddy. Sentences 1 and 4 form a mandatory pair. "complex system of dikes has to be built around the field" in sentence 1 links with "gates built into the dikes so the water flow can be adjusted precisely...." in sentence 4. Sentence 4 concludes the para. So, 2514. Sentence 3 is the odd sentence out. It focuses on rice and not how a rice paddy is built. The sentence can be a part of a para preceding the given para. Ans: (3)

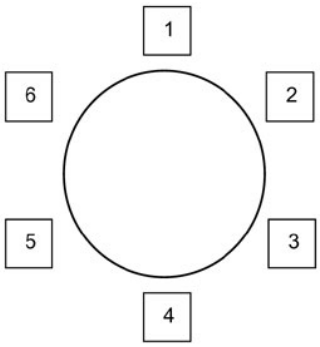
34. On a careful reading of the sentences, it can be observed that sentence 5 is a general sentence that begins the paragraph. It talks about brands facing restrictions in advertising. Sentence 5 is followed by sentence 4. "when it comes to advertising" in sentence 5 links with "marketing their products" in sentence 4. Also "face heavy restrictions" in sentence 5 links with "have suffered similar prohibitions" in sentence 4. Sentences 5 and 4 are followed by sentence 3. "These bans" in sentence 3 refer to the "heavy restrictions" and "similar prohibitions" mentioned in sentences 5 and 4 respectively. Sentence 1 follows sentence 3 as it talks about a consequence (practise their sales pitches) after the bans have been lifted. So, 5431. Sentence 2 is the odd sentence out. Actually, the second 'it' in sentence 2 refers to 'that process' in the same sentence. The reason that sentence 2 is less relevant to the context is because, when sentence 3 says 'may soon be lifted', that refers to possibility, not process. So, 'that process' in sentence 2 has no referent. Ans: (2)

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

SECTION – II

Solutions for questions 1 to 4:

Let the positions of the six persons around the table be denoted by 1 to 6 as shown in the figure below.



From (i), Birbal is opposite the person who placed the order for Entrée. From (iv), Chetan placed the order for Salad. Also, Hari must have placed the order for Entrée as he placed the order before Chetan.

Hence, Hari must be sitting opposite Birbal. Let Birbal be at 1 (in the diagram). Hari will be at 4.

From (iii), Gautam placed an order after Rahul. Hence, Gautam could have placed the order for Main Course or Sorbet (he did not place the order for a Dessert). Rahul could have placed the order for Soup or Main Course. If Rahul placed the order for Main Course, Gautam must have placed the order for Sorbet. From (ii), these two persons must be sitting opposite each other (i.e., three places to the right). But this will violate condition (iii). Hence, Rahul could not have placed the order for Main Course. Rahul placed the order for Soup.

Birbal did not place the order for Main Course. Birbal could not have placed an order for Sorbet because he is not sitting opposite the person who placed an order for Main Course. Hence, Birbal must have placed the order for Dessert. Akbar and Gautam must have placed the order for Sorbet and Main Course in any order. From (ii), they will be opposite each other.

From (v), Akbar must be at 2. Gautam will be at 5. From (i), Akbar could not have ordered the Sorbet. Hence, Gautam ordered the Sorbet and Akbar ordered the Main Course. From (iii), Rahul is not adjacent Gautam. Hence, Rahul must be at 3. Chetan must be at 6.The following table provides the positions of the six persons and the orders that they placed:

Position	Person	Order
1	Birbal	Dessert
2	Akbar	Main Course
3	Rahul	Soup
4	Hari	Entrée
5	Gautam	Sorbet
6	Chetan	Salad

1. Akbar placed the order for the Main Course. Choice (D)

2. The person sitting opposite Rahul, i.e., Chetan, placed an order for Salad. Choice (C)

3. The given condition is satisfied for only one pair of persons (Akbar and Rahul). Choice (B)

4. The person sitting opposite Gautam, i.e., Akbar, placed an order for Main Course. Three persons placed an order before him. Choice (A)

Solutions for questions 5 to 8:

5. The maximum difference in rainfall between any two consecutive days can be observed to have happened on Day 26 and Day 27. The difference is approximately 195 mm. Choice (D)

6. The rainfall did not exceed 200 mm for five consecutive days from Day 36 to Day 40 and also from Day 7 to Day 11. Choice (C)

7. The rainfall differed by 125 mm compared to the previous day for six days, Day 5, Day 7, Day 18, Day 27, Day 36 and Day 43. Choice (C)

8. We need to identify a set of three consecutive days in which the rainfall of at least one day is less than 125 mm, and the total rainfall over the three days does not exceed 375 mm (i.e., 125 × 3). By observation, we can see that there are two such sets of days – (Day 36, Day 37, Day 38) and (Day 38, Day 39, Day 40).
Note: The set (Day 37, Day 38, Day 39) comes close but the total exceeds 375 mm. Ans: (2)

Solutions for questions 9 to 12:

9. Number of tourists that visited the capital city of the states given in the options are calculated below:
Option A: KL: 20% × 65% = 13%; KA: 11.25%
Option B: TN: 21%; DL: 22%
Option C: MP: 5.5%; DL: 22%
Option D: KA: 11.25%; UP: 11.25%
Hence, equal number of tourists visited both KA and UP. Choice (D)

10. The following table provides the number of tourists that visited each capital city as a percentage of the total number of tourists that visited the country during the year:

Capital City of	Percentage
JK	1.5%
MP	5.5%
RJ	6.75%
KA	11.25%
KL	13%
AP	7.5%
TN	21%
PN	18%
DL	22%
UP	11.25%

The sum of the percentages of the tourists who visited each capital city = 117.75%
Hence, each tourist would have visited 1.1775 capital cities. Choice (D)

11. The capital city of RJ was visited by the third lowest number of tourists. Choice (C)

12. 45% of the tourists visited UP. These 45% did not visit any other state. Let p% of the tourists visit X. Since no tourist who visited UP visited X, (45+p)% of the tourists visited UP and X. The remaining tourists, i.e., 100 - (45 + p) = (55 – p)%, would have visited the other eight states. Since 40% of the tourists visited Delhi, the value of (55 – p) must be at least 40. This implies that p can be at most 15. Among the given states, the value of p is at most 15 for four states, RJ, KA, MP and JK. Hence, X can be any of the four states. Ans: (4)

Solutions for questions 13 to 16:

The total number of students who enrolled = 20 + 65 + 40 + 55 + 70 + 45 + 30 + 35 + 80 + 60 = 500
Number of students in Batch A through Batch E are 110, 115, 100, 90 and 85 respectively.

We will need to divide the ten values in the second pie chart into five pairs of two values such that the sum of the two values in each pair equals the number of students in one of the five batches of the first semester.

It is easier to start with the smallest value (among the five numbers for the five batches) because it is probable that there will be lesser number of possible pairs for the smaller numbers.

For the sum to be 85, the possibilities among the ten values are (60, 25) and (50,35).

For the sum to be 90, the possibilities among the ten values are (60, 30) and (50,40).

But from the given condition, the number of girls and boys cannot be 50 and 40 (since the number of girls in this case is only 25% more than the number of boys).

Hence, the number of girls and boys in Batch D are 60 and 30 respectively. The number of girls and boys in Batch E are 50 and 35 respectively.

For the sum to be 100, the possibilities are (80, 20), (75, 25), (60, 40). The last case is not possible since Batch D has 60 girls.

For the sum to be 110, the possibilities are (85, 25), (80, 30), (75, 35) and (60, 50). Among these four cases, only (85, 25) is possible. The number of girls and boys in Batch A will be 85 and 25 respectively. This will eliminate one more case for the number of boys and girls in Batch C. The number of girls and boys in Batch C will be 80 and 20 respectively.

The number of girls and boys in Batch B must be 75 and 40 respectively.

The following table provides this information:

Semester 1 Batch	Semester 2 Batches	Number of Boys	Number of Girls
Batch A	Batch 2, Batch 4	25	85
Batch B	Batch 3, Batch 5	40	75
Batch C	Batch 1, Batch 9	20	80
Batch D	Batch 7, Batch 10	30	60
Batch E	Batch 6, Batch 8	35	50

13. There were 25 boys in Batch A. Ans: (25)

14. Number of girls as a percentage of total students for

Batch A = $\frac{85}{110}\times 100$

Batch B = $\frac{75}{115}\times 100 = 65.22\%$

Batch C = $\frac{80}{100}\times 100$

Batch D = $\frac{2}{3}\times 100 = 66.67\%$

Batch E = $\frac{50}{85}\times 100$

We can see that the percentage is the third highest for Batch D. Choice (C)

15. Total number of girls as a percentage of total number of boys = $\frac{290}{210}\times 100 = 233.33\%$ Choice (B)

16. For four batches, Batch A, Batch B, Batch C and Batch D, the number of girls were more than the number of boys by at least 55%. Choice (D)

Solutions for questions 17 to 20:

Given that Train F travels to Kolkata. From (v), Train B starts from Bengaluru.

From (iv), the travel time of the train which starts from Kolkata is two hours. From (vi), this train goes to Delhi. From (i), neither Train A nor Train D can be this train. Train B and Train F also cannot be this train as they have other origin/destination cities. Train E cannot be this train because from (ii), the travel time of Train E is two hours more than that of Train C. If Train E takes two hours, then Train C must take 0 hours which is not possible.

Hence, the train which travels from Kolkata to Delhi is Train C and this train takes 2 hours.

From (ii), the travel time of Train E is 4 hours.

There is also a train (mentioned in (iii)) which goes from Chennai to Hyderabad and takes 3 hours. This train cannot be Train B or Train C or Train E or Train F (since they have different origin/destination/travel time). If this train is Train A, then the origin of Train D will be Hyderabad. From (vi), this is not possible. Hence, this train can only be Train D. From (i), the destination of Train A is Chennai.

Train A cannot start from Bengaluru or Kolkata or Chennai (since other trains start from these cities). It cannot start from Delhi (from (i)). It cannot be Hyderabad because then Train A and Train D will run between the same pair of cities. Hence, the origin of this train has to be Mumbai.

The origin of Train F cannot be Delhi since Train C travels from Kolkata to Delhi. Hence, the origin of Train F has to be Hyderabad. The destination of Train B must be Mumbai. Train E must be from Delhi to Bengaluru.

From (v), the travel time of Train B must be an average of travel times of Train A and Train F. Since the travel times are distinct positive integers less than 8, the travel time of Train B must be 6 hours and the travel time of Train A and Train F must be 5 and 7 in any order. From (iv), the travel time of Train F is 5 hours and that of Train A is 7 hours.

The following table provides the origins, destinations and the travel times of the six trains:

Train	Origin	Destination	Travel Time
Train A	Mumbai	Chennai	7
Train B	Bengaluru	Mumbai	6
Train C	Kolkata	Delhi	2
Train D	Chennai	Hyderabad	3
Train E	Delhi	Bengaluru	4
Train F	Hyderabad	Kolkata	5

17. Train F starts from Hyderabad. Choice (C)

18. The travel time of Train A is 7 hours. Choice (A)

19. Mumbai is the destination of Train B. Choice (D)

20. The person has to travel from Hyderabad to Kolkata to Delhi to Bengaluru.
If he starts at 9:00 AM, he will reach Kolkata at 2:00 PM. He can start from Kolkata next day at 9:00 AM and reach Delhi by 11:00 AM. He can start from Delhi at 1:00 PM and reach Bengaluru by 5:00 PM. Number of hours required = 32 hours.
If he starts at 1:00 PM, he will reach Kolkata at 6:00 PM. He can start from Kolkata next day at 9:00 AM and reach Delhi by 11:00 AM. He can start from Delhi at 1:00 PM and reach Bengaluru by 5:00 PM. Number of hours required = 28 hours. Choice (C)

Solutions for questions 21 to 24:

Let the positions of the classes be denoted by 1 to 7, with 1 representing the leftmost classroom and 7 representing the rightmost classroom.

Given that Class VI is at the extreme left and Class II is two places to the right of Class VI (from (v)). Hence, Class VI is at 1 and Class II is at 3. From (iii), Class III is to the immediate left of Class V. Also, from (ii), the number of students in the classroom

in the middle is 20 more than the one on the extreme right. The classroom in the middle cannot be Class III, as it has 45 students (the classroom at the extreme right must have 25 students, which is not possible). Hence, Class III and Class V can be at 5, 6 OR 6, 7. From (iii), Class V is not at the extreme right. Hence, Class III and Class V will be at 5 and 6.

From (i), Class VII cannot be at 2 or 4. Hence, Class VII can only be at 5, 6 or 7. Hence, Class VII will be at 7. This implies that Class IV and Class VIII must be at 2 and 4 in any order.

From (vi), the number of students in Class V can be 20 OR 40. The number of students in Class VIII will be 45 OR 65. Since Class III has 45 students, the number of students in Class VIII can only be 65 and the number of students in Class V can only be 40.

From (iv), the number of students in Class VI is 15 more than that in Class VII. From (ii), the number of students in the classroom in the middle must be 20 more than that in Class VII (which is at the extreme right). The possibilities for the number of students in Class VII, Class VI and the classroom in the middle are (20, 35, 40) OR (35, 50, 55). But in the first case, there will be no possibilities for the number of students in Class V. Hence, only the second case is possible, i.e., the number of students in Class VII, Class VI are 35 and 50. The number of students in the classroom in the middle is 55. Hence, Class VIII will be at 2 and Class IV will be in the middle. Class II will have 20 students.

The following table provides the number of students in each class and the order of the classrooms:

Position	1	2	3	4	5	6	7
Class	Class VI	Class VIII	Class II	Class IV	Class III	Class V	Class VII
Number of Students	50	65	20	55	45	40	35

21. The number of students in Class IV is 55. Ans: (55)

22. The number of students in Class II is 20. Ans: (20)

23. The total number of students in the classes present at the extreme ends = 85. Ans: (85)

24. The maximum difference in the number of students in the classrooms adjacent to each other occurs for Class VIII and Class II. Required difference = 45 Ans: (45)

Solutions for questions 25 to 28:

From (iii), Umesh can enter the cafeteria at 1:30 (30 minutes after the person who exits at 1:00 PM) or at 2:00 (30 minutes after the person who exits at 1:30 PM). However, Umesh cannot be the last person to enter the cafeteria (since he enters before Ramesh). Therefore, Umesh enters the cafeteria at 1:30 and leaves at 2:15.

From (iv), Srinath met exactly one person in the cafeteria. This is possible only if he entered at 12:15 PM.

From (i), Tarak and Vijay spent at least 15 minutes in the cafeteria together. They could have entered at 12:45 and 1:00 OR at 1:45 and 2:00. But from (iii), Ramesh entered after Umesh and only two persons entered after Umesh. Hence, Tarak and Vijay both could not have entered after Umesh. Therefore, Tarak and Vijay would have entered at 12:45 and 1:00, in that order (from (i)).

From (ii), Pavan is not the last person to enter the cafeteria. Hence, Pavan must be the fifth person to enter the cafeteria. Ramesh would be the last person to enter the cafeteria.

The following table provides the order in which the employees enter the cafeteria and the time at which each employee enters and exits the cafeteria:

Employee	**Entry Time**	**Exit Time**
Srinath	12:15	1:00
Tarak	12:45	1:30
Vijay	1:00	1:45
Umesh	1:30	2:15
Pavan	1:45	2:30
Ramesh	2:00	2:45

25. Ramesh was the last person to enter the cafeteria. Choice (A)

26. Vijay and Umesh were both in the cafeteria at 1:35 PM. Choice (B)

27. Umesh would have met the maximum number of employees, i.e., three persons, in the cafeteria. Choice (C)

28. Srinath would have spent the maximum time alone in the cafeteria. Choice (D)

Solutions for questions 29 to 32:

29. For the models which have a screen size of 5.1 inches, the highest ratio = $\frac{5.1}{250} = 0.0204$

For the models which have a screen size of 5.5 inches, the highest ratio = $\frac{5.5}{196} = 0.0281$

For the models which have a screen size of 5.75 inches, the highest ratio = $\frac{5.75}{240} = 0.0240$

For the models which have a screen size of 6.1 inches, the highest ratio = $\frac{6.1}{256} = 0.0238$

Hence, the ratio is the highest for the model with a screen size of 5.5 inches and weight of 196 gms, i.e., H4560. Choice (B)

30. We need to identify the models for which the Battery Capacity divided by 50 is at most the volume of the model. The models are S2340, N23, H1340, O1233, K144 and Y2394. Lowest price among these models = INR 15800. Choice (C)

31. The given condition is satisfied for five models, P234, N23, O1233, A123 and Y2394. Ans: (5)

32. For the models which have a storage of 32 GB, the highest ratio = $\frac{94.25}{32} = 2.945$

The next higher storage for any model is 64 GB, i.e., twice 32 GB. But the volume for none of the models is double (or more than double) that of 94.25. Hence, this is the highest ration. Choice (C)

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

SECTION – III

Solutions for questions 1 to 34:

1. $(a + 109) + (a + 110) + (a + 111) + \ldots\ldots + (a + 135)$

$= \frac{27}{2}[(a + 109) + (a + 135)]$

$= \frac{27}{2}[2a + 244]$

$= 27[a + 122]$

Now, $27[a + 122]$ must be a perfect cube.

Since 27 is already a perfect cube, $(a + 122)$ must also be a perfect cube. The nearest perfect cube above 122 is 125 (i.e., 5^3). Therefore, $a = 3$. Ans: (3)

2. If his supplies cost ₹100, he would fix the selling price as ₹140. Then, offering a 30% discount, he will sell them at ₹140 × 0.7 = ₹98, i.e., a loss of ₹2.

Therefore, his overall loss is 2%. Choice (A)

3. Let the equal roots be m and m.

$\Rightarrow b^2 - 4ac = 0$

$(2a + 3)^2 = 4^{n+1}$

$\Rightarrow 2a + 3 = 2^{n+1}$ or $-(2^{n+1})$

Since $2a + 3$ is always odd, (2^{n+1}) or $-(2^{n+1})$ should be odd. This is possible only when $2^{n+1} = 1$, i.e., when $n + 1 = 0$ (or $n = -1$).

$\therefore$ Only possible solutions for (a, n) are $(-1, -1)$ or $(-2, -1)$.

So, only one possible value of n exists. Choice (B)

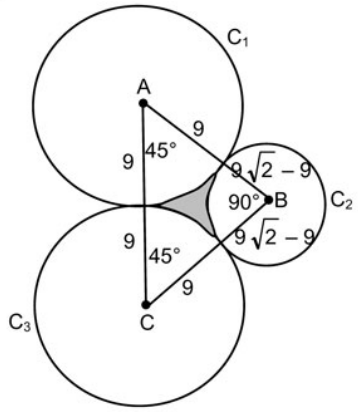
4. As t is a perfect square, $\sqrt{t}$ is a natural number.

The nearest perfect squares to t are $(\sqrt{t} - 1)^2$ and $(\sqrt{t} + 1)^2$.

$(\sqrt{t} + 1)^2 - t = 2\sqrt{t} + 1$ and $t - (\sqrt{t} - 1)^2 = 2\sqrt{t} - 1$

As the difference between t and $(\sqrt{t} - 1)^2$ is less than the difference between $(\sqrt{t} + 1)^2$ and t, the nearest perfect square to t is $(\sqrt{t} - 1)^2$, i.e., $t - 2\sqrt{t} + 1$. Choice (B)

5. Joining the centres of the three circles we get the following figure:



Let us denote the centres of the circles by A, B, and C respectively.

$AB = 9\sqrt{2}$, $BC = 9\sqrt{2}$ and $AC = 18$.

Therefore, ABC is a right angled isosceles triangle,

where $AB = BC = 9\sqrt{2}$ and $AC = 18$.

$\therefore \angle ABC = 90°$, $\angle BAC = \angle BCA = 45°$.

Therefore, area of the shaded region = Area of the triangle – Area of the sectors of the circles included within the triangle.

Area of the triangle $= \frac{1}{2}(9\sqrt{2})(9\sqrt{2}) = 81$

Area of the three sectors $= \frac{90}{360}\pi\left(9\left(\sqrt{2} - 1\right)\right)^2 + \frac{45}{360}\pi(9)^2 + \frac{45}{360}\pi(9)^2$

$= \frac{1}{4}\pi 81[3 - 2\sqrt{2}] + \frac{1}{8}\pi(81) + \frac{1}{8}\pi(81)$

$= \frac{1}{4}\pi 81[3 - 2\sqrt{2} + 1] = \frac{1}{4}\pi 81\left(4 - 2\sqrt{2}\right)$

$= 81\pi\left(1 - \frac{1}{\sqrt{2}}\right)$

$\therefore$ Required area $= 81\left(1 - \pi + \frac{\pi}{\sqrt{2}}\right)$ Choice (B)

6. Let us denote the amount with Rishi and the cost of the book by A and C respectively.

It is given that $0.6A = 0.8C \Rightarrow C = \frac{3}{4}A = 0.75A$

Again, $0.6A + (0.4)(0.4)A = C + 8$

$\Rightarrow 0.76A = 0.75A + 8$

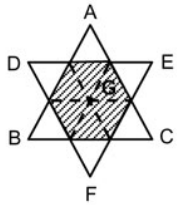
$\Rightarrow 0.01A = 8$

$\Rightarrow A = 800$ and $C = 600$

and the money left with Rishi = 800 – 600 = ₹200.

Choice (B)

7. Since there is no "cannot be determined" among the choices, consider two equilateral triangles.



In the figure shown ABC and DEF are two equilateral triangles. Their centroids coincide and DEF upon rotating through 180° coincides with ABC. Area of the shaded portion is required. This can easily be shown to be equal to 2/3rd the area of one triangle, by drawing six small equilateral triangles inside it.

$\therefore$ The required area $= \frac{2}{3}(300)$ sq.cm = 200 sq.cm

Choice (A)

8. $\frac{1}{x} - \frac{1}{y} = \frac{1}{6} \Rightarrow xy = 6(y - x)$ ------- (1)

Again, $xy^2 - yx^2 = 384$

$\Rightarrow xy(y - x) = 384$

$\Rightarrow 6(y - x)^2 = 384$

$\Rightarrow (y - x) = \pm 8$

$\Rightarrow (xy)^2 = (48)^2$

However, from equation (1), since both x and y are positive integers, xy will be positive and $(y - x) = 8$.

Alternative Solution:

Since x and y are positive integers, a quick trial and error based approach may directly give values of x and y that satisfy the given equations.

For example, x = 2 in eq (1), gives y = 3, which satisfies the first equation, but not the second.

Trying x = 3 in eq (1), gives y = 6 but this does not satisfy the second equation.

Trying x = 4 in eq (1) gives, y = 12 and these values satisfy the second equation also.

Hence, y – x = 12 – 4 = 8. Ans: (8)

9. $\log_3\left(\log_{3^m}\left(\log_{3^n}\left(3^{135}\right)\right)\right) = 0$

$\Rightarrow \log_{3^m}\left(\log_{3^n}\left(3^{135}\right)\right) = 1$

$\Rightarrow \log_{3^n}(3^{135}) = 3^m$

$\Rightarrow 3^{135} = \left(3^n\right)^{3^m} = 3^{n.3^m}$

$\therefore (n)3^m = 135 = 5(3^3)$

Therefore m can be 1 or 2 or 3.

If $m = 1$, $n(3^1) = 135 \Rightarrow n = 45$

If $m = 2$, $n(3^2) = 135 \Rightarrow n = 15$

If $m = 3$, $n(3^3) = 135 \Rightarrow n = 5$

Therefore, the possible values of $(m + n)$ are 46 or 17 or 8.

Thus, the maximum possible sum of $(m + n)$ is 46.

Choice (A)

10. A 100-digit number when multiplied by a 200-digit number will have either 299 or 300 digits in the product.

A 299-digit number, when multiplied by a 300-digit number, will have either 598 or 599 digits. Similarly, the product of two 300-digit numbers will have either 599 or 600 digits. So, there can be 598, 599 or 600 digits in the final product.

Choice (A)

11. Let us denote the three digit number by abc

It is given that, $abc = 22(a + b + c)$

$\Rightarrow 100a + 10b + c = 22a + 22b + 22c$

$\Rightarrow 78a = 12b + 21c$ --------- (1)

Now, $12b + 21c$ can be at most $12 \times 9 + 21 \times 9$, i.e., $108 + 189 = 297$.

Therefore, a can be at most 3, since $78 \times 4 > 297$.

Also, since $78a$ and $12b$ are even, c must be even.

Hence, a can be 1, 2, 3 and c must be even.

With these conditions, we can solve eq (1) considering three possible cases, i.e., $a = 1$, 2 and 3.

In case (i) If $a = 1$, clearly $c = 2$ and $b = 3$, i.e., $abc = 132$. In the other two cases, when a becomes 2, (or 3) we simply need to multiply each of c and b by 2 (or 3).

Hence, the other two cases give 2×132 and 3×132.

Hence, required sum $= 132 \times (1 + 2 + 3) = 132 \times 6 = 792$.

Choice (D)

12. It is given that $a \oplus b = \sqrt{ab-3}$

$\therefore (2 \oplus 6) \oplus 13 = \sqrt{2\times6-3} \oplus 13$

$= 3 \oplus 13$

$= \sqrt{3\times13-3}$

$= 6.$ Choice (D)

13. Each exchange of gifts between two persons will involve two gifts.

The total number of exchanges $= {}^{64}C_2 - {}^{32}C_2 - 32$, where

${}^{64}C_2$ = Total number of exchanges possible (had there been no constraint).

${}^{32}C_2$ = Number of exchanges between the men.

32 = Number of exchanges between a couple.

$\therefore$ Total no. of exchanges $= {}^{64}C_2 - {}^{32}C_2 - 32$

$= 2016 - 496 - 32$

$= 1488$

Therefore, the total number of gifts exchanged

$= 1488 \times 2 = 2976$.

Alternative Solution 1:

The first woman is involved in 62 exchanges

The second woman is involved in 61 more exchanges.

The third woman is involved in 60 more exchanges.

Proceeding in this manner, the total number of exchanges

$= 62 + 61 + 60 + \ldots + 31$

$= (62 + 61 + \ldots + 1) - (30 + 29 + \ldots + 1)$

$= \frac{62\times63}{2} - \frac{30\times31}{2} = 1488.$

Therefore, the total number of gifts exchanged

$= 1488 \times 2 = 2976$.

Alternative Solution 2:

Each woman receives a gift from 62 other people, 31 men and 31 women, while each man receives a gift from 31 women. Hence, total gifts $= 32 \times 62 + 32 \times 31 = 2976$.

Ans: (2976)

14. Let the capacity of the container be V buckets of water.

It is given that $\frac{4}{5}V - 2 = \frac{3}{4}V$

$\Rightarrow \frac{4}{5}V - \frac{3}{4}V = 2$

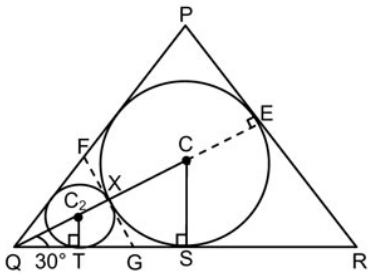
$\Rightarrow \frac{1}{20}V = 2$

$\Rightarrow V = 40$ buckets of water.

As the container is $\frac{4^{th}}{5}$ filled, the number of buckets of water required to fill the container $= \frac{1^{th}}{5}$ of $V = 8$.

Choice (C)

15.



Let the radius of the large circle and that of each of the small circles be R and r respectively.

Let CS and C_2T be the perpendicular dropped from C and C_2 on QR.

Now, $\frac{QC_2}{QC} = \frac{C_2T}{CS} = \frac{r}{R}$ [$\because$ C_2T is parallel to CS in Δ QCS]

$\Rightarrow \frac{QC - C_2C}{QC} = \frac{r}{R}$

$\Rightarrow 1 - \frac{(R+r)}{2R} = \frac{r}{R}$

$\left[\because C_2C = (R+r) \text{ and } QC = \frac{R}{\sin 30^\circ} = 2R\right]$

$\Rightarrow 1 - \frac{1}{2} - \frac{r}{2R} = \frac{r}{R}$

$\Rightarrow \frac{3}{2}\frac{r}{R} = \frac{1}{2}$

$\therefore r = \frac{1}{3}R.$

Circumference of the big circle $= 2\pi R$

Sum of the circumferences of the three small circles

$= 3(2\pi r) = 2\pi(3r) = 2\pi R$.

Thus, the required ratio is 1.

Alternative Solution:

Let one of the smaller circles and the larger circle touch at X, as shown above. If we draw FG parallel to PR, and passing through X, then ΔQFG will also be equilateral.
Further, QX = QE – XE.
Now, QE = 3CE, because QE is median and C is centroid.
Also, XE = 2CE.
Hence QX, (i.e., altitude of ΔQFG) = 3CE – 2CE = CE.
Therefore, $\frac{QX}{QE} = \frac{1}{3}$, i.e., ΔQFG is one-third in size compared to ΔPQR.

Thus, the circle inscribed in ΔQFG will be one-third in size (i.e., radius) compared to the larger circle. Hence, the sum of the circumferences of the three smaller circles will be equal to that of the large circle. Choice (C)

16. Let us denote the four-digit password by abcd.
As ab is divisible by 12, ab can be any multiple of 12.
Further, the first digit and the fourth digit form the cube of a natural number, which can be either 27 or 64, implying that the four digit number starts with 2 or 6.
Therefore the possible values are 24 _ 7 or 60 _ 4.
As the four-digit number is divisible by 11, it would be 2497 or 6094.
Now, the sum of the digits is known to be odd, so the only, possibility for the four-digit password is 6094.
Ans: (6094)

17. Let the cost price of the mixture be ₹a per kg, upon which a 25% profit is realised.
$\Rightarrow 1.25a = 60 \Rightarrow a = 48$
$\therefore n(42) + 24(50) = (n + 24)48$
$\Rightarrow 6n = 48$
$\therefore n = 8.$
Now, if the two varieties are mixed in the reverse ratio, we mix 24 kg of P with 8 kg of Q.
The average cost price = $\frac{24(42)+8(50)}{24+8}$ = ₹44 per kg
The selling price at which a profit of 25% is realised = 44(1.25) = ₹55 per kg. Choice (C)

18. It is given that (20 + *a*), (32 + *a*) and (50 + *a*) are in geometric progression.
$\therefore (32 + a)^2 = (20 + a)(50 + a)$ ---------- (1)
$1024 + 64a + a^2 = 1000 + 70a + a^2$
$\Rightarrow 6a = 24$
$\therefore a = 4.$
∴ The fourth term in the G.P. 24, 36, 54 …… is 81.
Choice (C)

19. Since no three of the seven numbers are equal, any number can be repeated at most two times. If we want Y to be minimised, the numbers with higher coefficients must be assigned values that are not greater than the numbers with the lower coefficients.
∴ G = 1, F = 1
E = 2, D = 2
C = 3, B = 3
and A = 4
∴ Y = 1(7 + 6) + 2(5 + 4) + 3(3 + 2) + 4(1) = 50
Ans: (50)

20. If a point (*a*, *b*) is reflected in the line *y* = *x*,
We get the point (*b*, *a*) whereas when it is reflected in the line *y* = –*x*, we get the point (–*b*, –*a*).

The line 2*x* + 3*y* = 6 intersects the axes at (3, 0) and (0, 2). Therefore, the reflection of this line in the line *y* = *x* gives L_1, which passes through (0, 3) and (2, 0).

Thus, the equation of L_1 is 3*x* + 2*y* = 6.
The line 3*x* – 2*y* = 12 intersects the axes at (4, 0) and (0, –6).

Therefore, the reflection of this line in the line *y* = –*x* gives L_2, which passes through (0,–4) and (6, 0).

Thus, the equation of L_2 is 2*x* – 3*y* = 12.
As the product of the slopes of L_1 and L_2 is $\left(\frac{-3}{2}\right)\times\left(\frac{-2}{-3}\right) = -1$, the acute angle between the lines is 90°.

Note: Since the original lines include an angle of 90°, their respective reflections in the lines *y* = *x* and *y* = –*x* will also include an angle of 90°. Choice (D)

21. Let E = $\frac{(x-1)(x-3)}{(x-2)(x-4)}$

E > 0	E < 0	E > 0	E < 0	E > 0
x = 1	2	3	4	

Consider the ranges (–∞, 1), (1, 2), (2, 3), (3, 4) and (4, ∞)
The expression is > 0, < 0, > 0, < 0, and > 0 for the respective ranges.
We are looking for a range of values of *x* in which there is no value which satisfies E > 0.
The range of values we are looking for is a subset of E < 0 i.e. (1, 2) ∪ (3, 4)
From the given options only $\left(\frac{5}{4}, \frac{5}{3}\right)$ fully satisfies E < 0.
Choice (D)

22. Let us denote the area of the triangle by Δ and let the altitudes P_1, P_2 and P_3 be to the sides AB, BC and AC respectively.
Now, $\frac{1}{2}(AB)P_1 = \Delta \Rightarrow AB = \frac{2\Delta}{P_1}$,
$\frac{1}{2}(BC)P_2 = \Delta \Rightarrow BC = \frac{2\Delta}{P_2}$ and
$\frac{1}{2}(AC)P_3 = \Delta \Rightarrow AC = \frac{2\Delta}{P_3}$
$\Rightarrow AB : BC : AC = \frac{1}{P_1} : \frac{1}{P_2} : \frac{1}{P_3}$
Let us check each of the given ratios for the triangle inequality.

Case (i): AB :BC : AC = $\frac{1}{1} : \frac{1}{3} : \frac{1}{3}$ = 3 : 1 : 1
As 1 + 1 < 3, it does not satisfy the triangle inequality. Therefore, case (i) is not admissible.

Case (ii): AB : BC : AC = $\frac{1}{2} : \frac{1}{4} : \frac{1}{5}$ = 10 : 5 : 4
As 4 + 5 < 10, it does not satisfy the triangle inequality. Therefore, case (ii) is not admissible.

Case (iii): AB : BC : AC = $\frac{1}{3} : \frac{1}{4} : \frac{1}{8}$ = 8 : 6 : 3
As 6 + 3 > 8, it satisfies the triangle inequality.

Case (iv): AB : BC : AC = $\frac{1}{3} : \frac{1}{5} : \frac{1}{8}$ = 40 : 24 : 15
As 24 + 15 < 40, it does not satisfy the triangle inequality. Therefore, case (iv) is not admissible.

Thus, only one of the given cases can be the ratio of P_1, P_2 and P_3.

Alternative Solution:

As a general rule, the triangle inequality holds good when each side of the triangle (in the inequality) is replaced with the reciprocal of the altitude drawn on to it. Hence, the

triangle inequality can directly be verified for the reciprocals of the ratios given in each case. Choice (B)

23. Let the capital of each male partner be ₹100x.
Then the capital of each of the female partner
$= 3 \times 100x =$ ₹300x.
Then the total capital $= 6 \times 100x + 4 \times 300x =$ ₹1800x
Let S be the total sales of the year.
Then profit = 0.35S
Interest paid to each female partner
= 10% of $300x =$ ₹30x
$\Rightarrow$ Total Interest paid $= 4 \times 30x =$ ₹120x
Total share of each female partner

$$= \frac{300x}{1800x}(0.35S - 120x) + 30x$$

Similarly the total share of each male partner

$$= \frac{100x}{1800x}(0.35S - 120x)$$

Since neither the value of S nor the value of x is known (or the ratio of S and x), the required ratio cannot be found.
Choice (D)

24. It is given that $(ab)_9 = (ba)_{13}$
Therefore $a > b < 9$
$9a + b = 13b + a$
$\Rightarrow 8a = 12b$

$$\therefore \frac{a}{b} = \frac{3}{2}.$$

Therefore $(ab)_9$ can be $(32)_9$ or $(64)_9$
Thus there are two ordered pairs (a, b) satisfying the given condition. Choice (C)

25. There are six possible pairs of balls that can be involved in a collision
$(\because {}^4C_2 = 6)$
Now out 57 collisions, 54 collisions can first be distributed as equally as possible among the six pairs. Hence each possible pair of balls collided.

$\frac{54}{6} = 9$ times. Then the remaining three collisions must be done by some three of the six pairs.
$\Rightarrow$ at least one pair of balls collided 9 + 1 = 10 times i.e., at least one ball collided at least 10 times with the same ball. Hence a statement that says "No ball collided ten times or more with the same ball" is not true.

Further, among the three pairs that were assigned a collision each, at least one more ball is involved twice, hence this ball would have collided another two times besides the earlier $9 \times 3 = 27$ times. Hence, at least one ball collided at least 27 + 2 = 29 times (with any other ball).

Statement IV is also definitely false. This is since, it is not possible for exactly one ball (say blue ball) to collide exactly 53 times with the same ball (say red ball), because inevitably the second ball, i.e., red ball, also would have collided exactly 53 times with the same ball, i.e., the blue ball (since a collision is always mutual).

Hence, statements I, II and IV are definitely false.
Choice (B)

26. It is given that $\sqrt{3a + \frac{1}{2}\sqrt{b}} - \sqrt{3a - \frac{1}{2}\sqrt{b}} = 2$

Squaring both sides, we get

$$3a + \frac{1}{2}\sqrt{b} + 3a - \frac{1}{2}\sqrt{b} - 2 - \sqrt{9a^2 - \frac{1}{4}b} = 4.$$

$$\Rightarrow 6a - 4 = 2\sqrt{9a^2 - \frac{1}{4}b}$$

$$\Rightarrow 3a - 2 = \sqrt{9a^2 - \frac{1}{4}b}$$

Squaring both sides once again, we get

$$9a^2 - 12a + 4 = 9a^2 - \frac{1}{4}b.$$

$$\Rightarrow \frac{1}{4}b = 12a - 4$$

$\therefore b = 16(3a - 1)$, i.e., (16×2) or (16×5) or (16×8) and so on.
Given $90 < b < 160$, only a = 3 gives a possible value of b, which is $16(3 \times 3 - 1) = 128$. Ans: (128)

27. Let the initial speed = v km/ph
Hence, total distance $= 63 \times v = 63v$ km
Now, as the speed doubled after every hour, the distances covered in each successive hour will be
$v, 2v, 2^2v, 2^3v$ .....
Hence, if n hours are taken for the journey,
$v + 2v + 2^2v + \ldots 2^{n-1}v = 63v$
$\Rightarrow n - 1 = 5$ (i.e., 1 + 2 + 4 + 8 + 16 + 32 = 63).
Hence, n = 6. Choice (C)

28. It may be observed that using 2 additional taps (over 12 taps) has decreased the time required from 96 minutes to 72 minutes.
$\Rightarrow$ Pumping rate of 2 taps

$= \left(\frac{96}{72} - 1\right) = 1/3$ times net pumping rate with 12 taps (also considering loss due to evaporation)
Now, to decrease the time from 96 minutes to 48 minutes, we need to double the net pumping rate.

Hence we will need $\frac{2}{(1/3)} = 6$ additional taps.

Hence, 12 + 6 = 18 taps are required in all.

Alternative solution:
Let x = rate of supply in litres / minutes by each pipe.
y = rate of evaporation in litres / minutes
Given $96 \times 12x - 96y = 72 \times 14x - 72y$ (= say V)
$\Rightarrow 6x = y$ and $V = 96 \times 6x$
Now, if 'n' taps fill the tank in 48 minutes, then
$48 \times nx - 48y = V$
$\Rightarrow 48(nx - 6x) = 96 \times 6x$
$\Rightarrow n - 6 = 12 \Rightarrow n = 18$ Choice (C)

29. Let us find the effective percentage discounts given by each of the four shops.
Shop A: Out of 5 shirts, he needs to pay for 3. Therefore, the percentage discount $= \frac{2}{5} \times 100 = 40\%$
Shop B: Selling price $= (1 - 0.1)(1 - 0.3) = 0.63$
$\Rightarrow$ discount = 37%
Shop C: The discount percentage is 45%.
Shop D: Out of 3 shirts, he needs to pay for 2.
Therefore, the percentage discount $= \frac{1}{3} \times 100$
$= 33\frac{1}{3}\%$
Since, Shop C offers the highest effective percentage discount, it would be the best deal for Ankush.
Choice (C)

30. Let us solve the problem by considering the activities done by Mary in the reverse order.
She spent two third of the remaining time revising the PPT. So she is left with one third of the remaining time, which is 10 minutes (8:50 a.m. to 9 a.m.)
Therefore, it was 8:30 a.m. when she finished revising the PPT.

Before that, she spent $\frac{2^{th}}{7}$ of the time remaining having breakfast, and was hence left with $\frac{5^{th}}{7}$ of the remaining time, which was 30 minutes.

$\therefore \frac{5}{7}t_1 = 30 \Rightarrow t_1 = 42$ minutes

$\therefore$ It was 8 : 18 am when she started having the breakfast.

Before that, she spent $\frac{2^{th}}{5}$ of the remaining time to dress up, and hence she was left with $\frac{3^{th}}{5}$ of the remaining time, which is equal to 42 minutes.

$\therefore \frac{3}{5}t_2 = 42 \Rightarrow t_2 = 70$ minutes

$\therefore$ It was 7:50 a.m. when she started dressing up.

Before that, she used $\frac{3^{th}}{8}$ of the remaining time for shower, and hence she was left with $\frac{5^{th}}{8}$ of the remaining time, which is equal to 70 minutes.

$\frac{5}{8}t_3 = 70 \Rightarrow t_3 = 112$

Therefore, she started having a shower at 7:08 am.

Thus, she woke up at 7:08 am and spent 112 – 10 = 102 minutes to complete the four activities.

Alternative Solution:

Let the time remaining (upto 9 a.m.) when Mary woke up be *x* minutes.
Therefore, time remaining after shower, getting dressed, breakfast and PPT will be $\frac{5}{8}x$, $\left(\frac{5}{8}\right)\left(\frac{3}{5}\right)x$, $\left(\frac{5}{8}\right)\left(\frac{3}{5}\right)\left(\frac{5}{7}\right)x$ and $\left(\frac{5}{8}\right)\left(\frac{3}{5}\right)\left(\frac{5}{7}\right)\left(\frac{1}{3}\right)x$.

Given, the final time remaining = 9:00 a.m. – 8:50 a.m. = 10 min, we get $\left(\frac{5}{8}\right)\left(\frac{3}{5}\right)\left(\frac{5}{7}\right)\left(\frac{1}{3}\right)x = \frac{5}{56}x = 10$

$\Rightarrow$ x = 112 and time spent on the four activities = 112 – 10 = 102 min. Ans: (102)

31. As a particular man is always included and a particular woman is always excluded, we need to select five more members, from the remaining eight members, which can be done in $^8C_5$ or 56 ways. Choice (B)

32. It is given that, cos5A + cos5B + cos5C = 1
Now A + B + C = 180°
$\therefore$ 5A + 5B + 5C = 900°
$\Rightarrow$ 5C = 900° – (5A + 5B)
$\therefore$ cos5C = cos[900° – (5A + 5B)] = –cos(5A + 5B)
[$\because$ cos[5(180°) – θ] = –cos θ]
$\therefore$ cos5A + cos5B – cos(5A + 5B) = 1
cos5A + cos5B – cos5A cos5B + sin5A sin5B = 1
[$\because$ cos(X + Y) = cosX cosY – sinX sinY]
$\Rightarrow$ 1 – cos5A – cos5B + cos5A cos5B = sin5A sin5B

$$\Rightarrow \frac{(1-\cos 5A)}{\sin 5A}\frac{(1-\cos 5B)}{\sin 5B} = 1$$

$$\Rightarrow \frac{\left[1-\left(1-2\sin^2(5A/2)\right)\right]}{2\sin(5A/2)\cos(5A/2)}\frac{\left[1-\left(1-2\sin^2(5B/2)\right)\right]}{2\sin(5B/2)\cos(5B/2)} = 1$$

$$\Rightarrow \left[\frac{\sin(5A/2)}{\cos(5A/2)}\right]\left[\frac{\sin(5B/2)}{\cos(5B/2)}\right] = 1$$

$\Rightarrow$ tan(5A/2) tan(5B/2) = 1

$\therefore$ tan(5A/2) = $\frac{1}{\tan 5B/2}$ = cot(5B/2) = tan (90° – $\frac{5B}{2}$)

$\therefore$ 5A/2 = 90 – 5B/2

$\Rightarrow \frac{5}{2}$(A + B) = 90°

$\therefore$ A + B = 36°.

$\Rightarrow$ C = 180 – 36 = 144°.

Therefore the maximum value of any angle in the triangle is 144°.

Alternative Solution:

Let A be the largest angle. If A is maximum, then B + C must be minimum. Since B and C are interchangeable in the given expression, they are equivalent. Hence, for maximizing A, we can take B = C, and B = C = $\frac{(180-A)}{2}$

$\therefore$ cos5A + cos5B + 5C = 1
$\Rightarrow$ cos5A + 2cos5B = 1

$$\Rightarrow \cos 5A + 2\cos 5\left(90-\frac{A}{2}\right) = 1$$

$$\Rightarrow \cos 5A + 2\cos\left(450-\frac{5A}{2}\right) = 1$$

$$\Rightarrow 1 - 2\sin^2\left(\frac{5A}{2}\right) + 2\sin\left(\frac{5A}{2}\right) = 1$$

$$\Rightarrow \sin\left(\frac{5A}{2}\right)\left(\sin\left(\frac{5A}{2}\right)-1\right) = 0 \quad \rightarrow \quad (1)$$

From (1),

Either $\sin\left(\frac{5A}{2}\right)$ = 0, i.e., $\frac{5A}{2}$ = 0°, 180°, 360°, ……..

OR

$\sin\left(\frac{5A}{2}\right)$ = 1, i.e., $\frac{5A}{2}$ = 90°, 450°, ……

Since A < 180°, the max value of $\frac{5A}{2}$ < 450°

Therefore, $\frac{5A}{2}$ = 360 (from above possibilities)

$\Rightarrow$ A = 144°. Ans: (144)

33. We consider the options.
Option (A): $f(x) = x^3$, in which for $x > 0$, $f(x) > 0$. But the given graph contradicts this.

Option (B): $f(x) = x|x|$

If $x \geq 0$, $|x| = x$.

$\therefore$ $f(x) = x^2$, if $x \geq 0$.
This implies that, for positive values of x, $f(x) > 0$, which is not true for the given graph.

Option (C): $f(x) = -x^2$. If $x < 0$, $x^2 > 0$ and $-x^2 < 0$, but the given graph contradicts this.

Option (D): $f(x) = -x|x|$.

If $x \geq 0$, $|x| = x$ and if $x < 0$, $|x| = -x$.

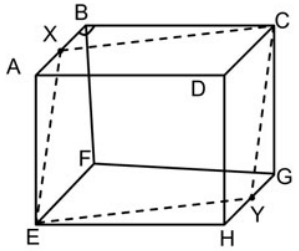
$\therefore$ $f(x) = -x^2$, if $x \geq 0$ and $f(x) = x^2$, if $x < 0$.

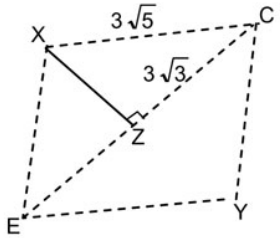
The graph is consistent with this.

Therefore the given graph is best described by $f(x) = -x|x|$.

Choice (D)

34.





In right triangle XBC, XC = $\sqrt{XB^2 + BC^2}$

$= \sqrt{3^2 + 6^2} = 3\sqrt{5}$

Similarly, CY = YE = EX = XC = $3\sqrt{5}$ (from symmetry)

Also, EC = longest diagonal of the cube

$= \sqrt{6^2 + 6^2 + 6^2}$

$= 6\sqrt{3}$

We drop a perpendicular from X to EC at Z, which will bisect EC. [$\because$ XEC is an isosceles triangle]

XZ = $\sqrt{XC^2 - ZC^2} = \sqrt{(3\sqrt{5})^2 - (3\sqrt{3})^2} = 3\sqrt{2}$

Area of the quadrilateral XCYE = 2 (Area of Δ XEC)

$= 2\left(\frac{1}{2} \times 6\sqrt{3} \times 3\sqrt{2}\right)$

$= 18\sqrt{6}$.

Alternative Solution:

If the corner E of the cube is imagined to be the origin (in x-y-z co-ordinate space) with the positive x, y and z-axes along $\overrightarrow{EH}$, $\overrightarrow{EA}$ and $\overrightarrow{EF}$ respectively, then the co-ordinates of points E, X, Y and C will be (0, 0, 0), (0, 6, 3), (6, 0, 3) and (6, 6, 6).

Now, from symmetry, XECY is a rhombus and area = $\frac{1}{2} d_1 d_2 = \frac{1}{2}(EC)(XY)$.

Now, EC = $\sqrt{(6-0)^2 + (6-0)^2 + (6-0)^2} = 6\sqrt{3}$, and

XY = $\sqrt{(0-6)^2 + (6-0)^2 + (3-3)^2} = 6\sqrt{2}$.

Hence, area = $\frac{1}{2}\left(6\sqrt{3}\right)\left(6\sqrt{2}\right) = 18\sqrt{6}$. Choice (C)

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