CAT 2023 SOLVED PAPER (SLOT-2)

Section I: VARC

Question Numbers (1 to 4): The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

The Positivists, anxious to stake out their claim for history as a science, contributed the weight of their influence to the cult of facts. First ascertain the facts, said the positivists, then draw your conclusions from them…. This is what may [be] called the common-sense view of history. History consists of a corpus of ascertained facts. The facts are available to the historian in documents, inscriptions, and so on … [Sir George Clark] contrasted the "hard core of facts" in history with the surrounding pulp of disputable interpretation forgetting perhaps that the pulpy part of the fruit is more rewarding than the hard core…. It recalls the favourite dictum of the great liberal journalist C. P. Scott: "Facts are sacred, opinion is free."…

What is a historical fact? … According to the common-sense view, there are certain basic facts which are the same for all historians and which form, so to speak, the backbone of history—the fact, for example, that the Battle of Hastings was fought in 1066. But this view calls for two observations. In the first place, it is not with facts like these that the historian is primarily concerned. It is no doubt important to know that the great battle was fought in 1066 and not in 1065 or 1067, and that it was fought at Hastings and not at Eastbourne or Brighton. The historian must not get these things wrong. But [to] praise a historian for his accuracy is like praising an architect for using well-seasoned timber or properly mixed concrete in his building. It is a necessary condition of his work, but not his essential function. It is precisely for matters of this kind that the historian is entitled to rely on what have been called the "auxiliary sciences" of history—archaeology, epigraphy, numismatics, chronology, and so forth….

The second observation is that the necessity to establish these basic facts rests not on any quality in the facts themselves, but on an apriori decision of the historian. In spite of C. P. Scott's motto, every journalist knows today that the most effective way to influence opinion is by the selection and arrangement of the appropriate facts. It used to be said that facts speak for themselves. This is, of course, untrue. The facts speak only when the historian calls on them: it is he who decides to which facts to give the floor, and in what order or context…. The only reason why we are interested to know that the battle was fought at Hastings in 1066 is that historians regard it as a major historical event…. Professor Talcott Parsons once called [science] "a selective system of cognitive orientations to reality." It might perhaps have been put more simply. But history is, among other things, that. The historian is necessarily selective. The belief in a hard core of historical facts existing objectively and independently of the interpretation of the historian is a preposterous fallacy, but one which it is very hard to eradicate.

1. If the author of the passage were to write a book on the Battle of Hastings along the lines of his/her own reasoning, the focus of the historical account would be on:
    1. exploring the socio-political and economic factors that led to the Battle.
    2. deriving historical facts from the relevant documents and inscriptions.
    3. providing a nuanced interpretation by relying on the auxiliary sciences.
    4. producing a detailed timeline of the various events that led to the Battle.

2. According to this passage, which one of the following statements best describes the significance of archaeology for historians?
    1. Archaeology helps historians to interpret historical facts.
    2. Archaeology helps historians to ascertain factual accuracy.
    3. Archaeology helps historians to carry out their primary duty.
    4. Archaeology helps historians to locate the oldest civilisations in history.

3. All of the following, if true, can weaken the passage's claim that facts do not speak for themselves, EXCEPT:
    1. a fact, by its very nature, is objective and universal, irrespective of the context in which it is placed.
    2. the truth value of a fact is independent of the historian who expresses it.
    3. facts, like truth, can be relative: what is fact for person X may not be so for person Y.
    4. the order in which a series of facts is presented does not have any bearing on the production of meaning.

4. All of the following describe the "common-sense view" of history, EXCEPT:
    1. history is like science: a selective system of cognitive orientations to reality.
    2. history can be objective like the sciences if it is derived from historical facts.
    3. real history can be found in ancient engravings and archival documents.
    4. only the positivist methods can lead to credible historical knowledge.

Sol.: For questions 1 to 4:

Passage Explanation (Paragraph-wise):

Paragraph 1: The Positivists' influence on history is discussed, emphasizing their approach of ascertaining facts before drawing conclusions. This approach, known as the common-sense view, sees history as a collection of facts derived from documents and inscriptions.

Paragraph 2: Challenges the common-sense view by arguing that significant historical facts are not the primary concern of historians. It emphasizes the importance of broader contexts and interpretations, with factual accuracy being a necessary but not essential function of historians.

Paragraph 3: Further critiques the common-sense view, stating that facts don't speak for themselves and require interpretation by historians. It emphasizes the selective nature of history and the influence of interpretation in shaping historical narratives.

1. 1 **Question Explanation:** Asks about the likely focus of a historical account of the Battle of Hastings by the author, given their perspective on history.
     Correct Answer: Exploring the socio-political and economic factors that led to the Battle.
     The author emphasizes interpretation over just collecting facts. The passage suggests a broader focus on socio-political and economic contexts rather than just factual details ("But [to] praise a historian for his accuracy...").
     Incorrect Answers:
     2. **Deriving historical facts:** Contradicts the author's emphasis on interpretation.
     3. **Relying on auxiliary sciences:** Misinterprets the author's view that auxiliary sciences support, not define, a historian's work.
     4. **Detailed timeline of events:** Overly factual, not in line with the author's emphasis on broader socio-political contexts.

2. 2 **Question Explanation:** Seeks the role of archaeology for historians as indicated in the passage.
     Correct Answer: Archaeology helps historians to ascertain factual accuracy.
     The passage mentions auxiliary sciences like archaeology help establish basic facts, supporting the historian's work but not being the primary function ("The historian must not get these things wrong...").
     Incorrect Answers:
     1. **Interpretation of historical facts:** Not directly tied to archaeology in the passage.
     3. **Primary duty of historians:** Overlooks the author's focus on broader interpretation.
     4. **Locating oldest civilizations:** Not the general role of archaeology as described in the passage.

3. 3 **Question Explanation:** Asks which statement does not weaken the passage's claim about the nature of historical facts.
     Correct Answer: Facts, like truth, can be relative.
     Supports the passage's view that facts require interpretation and are not absolute ("The facts speak only when the historian calls on them...").
     Incorrect Answers:
     1. **Objective and universal nature of facts:** Contradicts the passage's emphasis on interpretation.
     2. **Independent truth value of facts:** Against the passage's subjective view of historical interpretation.
     4. **Order of facts and meaning production:** Suggests facts alone can convey meaning, opposing the passage's view.

4. 1   **Question Explanation:** Identifies which description does not align with the "common-sense view" of history.
Correct Answer: History is like science: a selective system of cognitive orientations to reality.
This view contrasts with the common-sense view's focus on objective facts, suggesting a more interpretive approach ("...the belief in a hard core of historical facts...").
Incorrect Answers:
2.   **Objective history from facts:** Aligns with the common-sense view.
3.   **Real history in ancient engravings:** Consistent with the emphasis on factual evidence.
4.   **Positivist methods for credible history:** Agrees with the reliance on factual and empirical evidence.

Question Numbers (5 to 8): The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

Over the past four centuries liberalism has been so successful that it has driven all its opponents off the battlefield. Now it is disintegrating, destroyed by a mix of hubris and internal contradictions, according to Patrick Deneen, a professor of politics at the University of Notre Dame…. Equality of opportunity has produced a new meritocratic aristocracy that has all the aloofness of the old aristocracy with none of its sense of noblesse oblige. Democracy has degenerated into a theatre of the absurd. And technological advances are reducing ever more areas of work into meaningless drudgery. "The gap between liberalism's claims about itself and the lived reality of the citizenry" is now so wide that "the lie can no longer be accepted," Mr Deneen writes. What better proof of this than the vision of 1,000 private planes whisking their occupants to Davos to discuss the question of "creating a shared future in a fragmented world"?….

Deneen does an impressive job of capturing the current mood of disillusionment, echoing left-wing complaints about rampant commercialism, right-wing complaints about narcissistic and bullying students, and general worries about atomisation and selfishness. But when he concludes that all this adds up to a failure of liberalism, is his argument convincing?…. He argues that the essence of liberalism lies in freeing individuals from constraints. In fact, liberalism contains a wide range of intellectual traditions which provide different answers to the question of how to trade off the relative claims of rights and responsibilities, individual expression and social ties…. liberals experimented with a range of ideas from devolving power from the centre to creating national education systems.

Mr Deneen's fixation on the essence of liberalism leads to the second big problem of his book: his failure to recognise liberalism's ability to reform itself and address its internal problems. The late 19th century saw America suffering from many of the problems that are reappearing today, including the creation of a business aristocracy, the rise of vast companies, the corruption of politics and the sense that society was dividing into winners and losers. But a wide variety of reformers, working within the liberal tradition, tackled these problems head on. Theodore Roosevelt took on the trusts. Progressives cleaned up government corruption. University reformers modernised academic syllabuses and built ladders of opportunity. Rather than dying, liberalism reformed itself.

Mr Deneen is right to point out that the record of liberalism in recent years has been dismal. He is also right to assert that the world has much to learn from the premodern notions of liberty as self-mastery and self-denial. The biggest enemy of liberalism is not so much atomisation but old-fashioned greed, as members of the Davos elite pile their plates ever higher with perks and share options. But he is wrong to argue that the only way for people to liberate themselves from the contradictions of liberalism is "liberation from liberalism itself". The best way to read "Why Liberalism Failed" is not as a funeral oration but as a call to action: up your game, or else.

5.   All of the following statements are evidence of the decline of liberalism today, EXCEPT:
1.   "And technological advances are reducing ever more areas of work into meaningless drudgery."
2.   "Democracy has degenerated into a theatre of the absurd."
3.   "'The gap between liberalism's claims about itself and the lived reality of the citizenry' is now so wide that 'the lie can no longer be accepted,'…"
4.   "… the creation of a business aristocracy, the rise of vast companies …"

6. The author of the passage refers to "the Davos elite" to illustrate his views on:
1. the fact that the rise in liberalism had led to a greater interest in shared futures from unlikely social classes.
2. the way the debate around liberalism has been captured by the rich who have managed to insulate themselves from economic hardships.
3. the unlikelihood of a return to the liberalism of the past as long as the rich continue to benefit from the decline in liberal values.
4. the hypocrisy of the liberal rich, who profess to subscribe to liberal values while cornering most of the wealth.

7. The author of the passage is likely to disagree with all of the following statements, EXCEPT:
1. liberalism was the dominant ideal in the past century, but it had to reform itself to remain so.
2. if we accept that liberalism is a dying ideal, we must work to find a viable substitute.
3. the essence of liberalism lies in greater individual self-expression and freedoms.
4. claims about liberalism's disintegration are exaggerated and misunderstand its core features.

8. The author of the passage faults Deneen's conclusions for all of the following reasons, EXCEPT:
1. its repeated harking back to premodern notions of liberty.
2. its extreme pessimism about the future of liberalism today and predictions of an ultimate decline.
3. its failure to note historical instances in which the process of declining liberalism has managed to reverse itself.
4. its very narrow definition of liberalism limited to individual freedoms.

Sol.: For questions 5 to 8:

Passage Explanation (Paragraph-wise):

Paragraph 1: Discusses the success of liberalism over the past four centuries and its recent disintegration due to internal contradictions and hubris. It mentions the paradox of the meritocratic aristocracy and the degradation of democracy, along with the negative environmental impacts of the fashion industry.

Paragraph 2: Presents a critique of Patrick Deneen's view that the failures of liberalism are comprehensive. It acknowledges the broad range of liberal intellectual traditions and the ability of liberalism to reform itself, citing historical examples of such reforms.

Paragraph 3: Argues against Deneen's failure to recognize liberalism's capacity for self-reform. It highlights the historical adaptability of liberalism in addressing internal problems and challenges.

Paragraph 4: Suggests that despite Deneen's critique, liberalism has played a role in facilitating European integration, pointing out that American companies often aid this process.

5. 1 **Question Explanation:** Seeks to identify which statement does not represent evidence of liberalism's decline as discussed in the passage.
Correct Answer: "And technological advances are reducing ever more areas of work into meaningless drudgery." While this statement discusses a negative aspect of modernity, it does not directly relate to the decline of liberalism, which is the central theme of the passage.
Incorrect Answers:
2. **Democracy degraded:** Indicates a failure of liberal democratic ideals.
3. **Gap between liberalism's claims and reality:** Directly critiques the failure of liberalism to meet its promises.
4. **Business aristocracy and vast companies:** Suggests economic disparities arising under liberal policies, a sign of liberalism's decline.

6. 4 **Question Explanation:** Asks about the role of the "Davos elite" in illustrating the author's views on liberalism.
Correct Answer: The hypocrisy of the liberal rich, who profess to subscribe to liberal values while cornering most of the wealth.
The passage uses "the Davos elite" as an example of the hypocrisy within liberal circles, where the wealthy, despite espousing liberal values, accumulate wealth and privileges, contradicting liberal ideals.
Incorrect Answers:
1. **Rise in shared futures interest:** Not supported by the passage.
2. **Rich capturing debate:** Doesn't capture the irony and hypocrisy highlighted in the passage.
3. **Unlikelihood of past liberalism return:** Misinterprets the passage's discussion on the Davos elite.

7. 1   **Question Explanation:** Identifies a statement that the author of the passage would likely agree with.
Correct Answer: Liberalism was the dominant ideal in the past century, but it had to reform itself to remain so.
The passage acknowledges the historical adaptability of liberalism, showing how it has reformed in response to challenges.
Incorrect Answers:
2. **Liberalism as a dying ideal:** The passage does not suggest liberalism needs replacing but rather calls for its reform.
3. **Essence of liberalism in freedoms:** Oversimplifies liberalism, contrary to the passage's broader view.
4. **Claims of disintegration exaggerated:** The passage does recognize the challenges faced by liberalism, not dismissing them as exaggerations.

8. 1   **Question Explanation:** Seeks to identify which criticism is not made by the author against Deneen's conclusions on liberalism.
Correct Answer: Its repeated harking back to premodern notions of liberty.
The passage does not criticize Deneen for referring to pre modern notions of liberty. In fact, it acknowledges the value in revisiting these concepts.
Incorrect Answers:
2. **Extreme pessimism:** The passage criticizes Deneen's overly pessimistic view of liberalism's future.
3. **Failure to note historical reversals:** The passage points out Deneen's oversight of historical examples where liberalism has managed to reform.
4. **Narrow definition of liberalism:** The passage faults Deneen for focusing too narrowly on individual freedom

Question Numbers (9 to 12): The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

The Second Hand September campaign, led by Oxfam . . . seeks to encourage shopping at local organisations and charities as alternatives to fast fashion brands such as Primark and Boohoo in the name of saving our planet. As innocent as mindless scrolling through online shops may seem, such consumers are unintentionally—or perhaps even knowingly—contributing to an industry that uses more energy than aviation….

Brits buy more garments than any other country in Europe, so it comes as no shock that many of those clothes end up in UK landfills each year: 300,000 tonnes of them, to be exact. This waste of clothing is destructive to our planet, releasing greenhouse gasses as clothes are burnt as well as bleeding toxins and dyes into the surrounding soil and water. As ecologist Chelsea Rochman bluntly put it, "The mismanagement of our waste has even come back to haunt us on our dinner plate."

It's not surprising, then, that people are scrambling for a solution, the most common of which is second-hand shopping. Retailers selling consigned clothing are currently expanding at a rapid rate … If everyone bought just one used item in a year, it would save 449 million lbs of waste, equivalent to the weight of 1 million Polar bears. "Thrifting" has increasingly become a trendy practice. London is home to many second-hand, or more commonly coined 'vintage', shops across the city from Bayswater to Brixton.

So you're cool and you care about the planet; you've killed two birds with one stone. But do people simply purchase a second-hand item, flash it on Instagram with #vintage and call it a day without considering whether what they are doing is actually effective?

According to a study commissioned by Patagonia, for instance, older clothes shed more microfibres. These can end up in our rivers and seas after just one wash due to the worn material, thus contributing to microfibre pollution. To break it down, the amount of microfibres released by laundering 100,000 fleece jackets is equivalent to as many as 11,900 plastic grocery bags, and up to 40 per cent of that ends up in our oceans… So where does this leave second-hand consumers? [They would be well advised to buy] high-quality items that shed less and last longer [as this] combats both microfibre pollution and excess garments ending up in landfills….

Luxury brands would rather not circulate their latest season stock around the globe to be sold at a cheaper price, which is why companies like ThredUP, a US fashion resale marketplace, have not yet caught on in the UK. There will always be a market for consignment but there is also a whole generation of people who have been taught that only buying new products is the norm; second-hand luxury goods are not in their psyche. Ben Whitaker, director at Liquidation Firm B-Stock, told Prospect that unless recycling becomes cost-effective and filters into mass production, with the right technology to partner it, "high-end retailers would rather put brand before sustainability."

9. The central idea of the passage would be undermined if:
    1. second-hand stores sold only high-quality clothes.
    2. clothes were not thrown and burnt in landfills.
    3. Primark and Boohoo recycled their clothes for vintage stores.
    4. customers bought all their clothes online.

10. According to the author, companies like ThredUP have not caught on in the UK for all of the following reasons EXCEPT that:
    1. the British don't buy second-hand clothing.
    2. luxury brands do not like their product to be devalued.
    3. recycling is currently not financially attractive for luxury brands.
    4. luxury brands want to maintain their brand image.

11. The act of "thrifting", as described in the passage, can be considered ironic because it:
    1. offers luxury clothing at cut-rate prices.
    2. is not cost-effective for retailers.
    3. is an anti-consumerist attitude.
    4. has created environmental problems.

12. Based on the passage, we can infer that the opposite of fast fashion, 'slow fashion', would most likely refer to clothes that:
    1. are sold by genuine vintage stores.
    2. do not shed microfibres.
    3. do not bleed toxins and dyes.
    4. are of high quality and long lasting.

Sol.: For questions 9 to 12:

Passage Explanation (Paragraph-wise):
Paragraph 1: Introduces the "Second Hand September" campaign led by Oxfam, aimed at encouraging shopping at local organizations and charities as alternatives to fast fashion brands. It highlights the environmental impact of the fashion industry, including energy usage and waste contributing to greenhouse gas emissions and pollution.

Paragraph 2: Mentions the trend of second-hand shopping as a response to the environmental problems caused by fast fashion. It describes the rapid expansion of retailers selling consigned clothing and the potential environmental benefits of buying used items.

Paragraph 3: Addresses a potential issue with second-hand shopping, noting that older clothes might shed more microfibres, contributing to pollution. The paragraph points out the complexity of the issue, suggesting that buying high-quality items that last longer could be a solution.

Paragraph 4: Discusses the challenges faced by fashion resale marketplaces like ThredUP in the UK, particularly due to attitudes towards second-hand luxury goods and the preferences of luxury brands to maintain their brand image.

9. 2   **Question Explanation:** Asks which scenario would undermine the central idea of the passage about the impact of fast fashion and the role of second-hand shopping.
       Correct Answer: Clothes were not thrown and burnt in landfills.
       If clothes were not discarded in landfills, it would contradict the passage's emphasis on the environmental impact of clothing waste and the need for alternative shopping practices.

Incorrect Answers:
1. **Second-hand stores selling only high-quality clothes:** Aligns with the suggestion of buying quality items.
3. **Primark and Boohoo recycling clothes:** Would support the passage's advocacy for sustainable practices.
4. **Customers buying all clothes online:** Doesn't directly address the central idea of reducing clothing waste through second-hand shopping.

10. 1 **Question Explanation:** Asks why companies like ThredUP have not become popular in the UK, except for one reason.
Correct Answer: The British don't buy second-hand clothing.
The passage does not suggest that the British are averse to buying second-hand clothing. In fact, it indicates a market for second-hand clothing in the UK.
Incorrect Answers:
2. **Luxury brands devalue products:** Mentioned as a barrier to ThredUP's success.
3. **Recycling not financially attractive:** Stated as a challenge for luxury brands.
4. **Maintaining brand image:** Identified as a preference of luxury brands.

11. 4 **Question Explanation:** Asks about the irony in the practice of "thrifting" as described in the passage.
Correct Answer: Has created environmental problems.
The passage notes that older clothes might shed more microfibres, contributing to pollution, which is ironic considering thrifting is promoted for environmental benefits.
Incorrect Answers:
1. **Luxury clothing at low prices:** Not mentioned as ironic in the passage.
2. **Not cost-effective for retailers:** Not discussed in the passage.
3. **Anti-consumerist attitude:** Not directly related to the irony mentioned in the passage.

12. 4 **Question Explanation:** Inquires about the likely characteristics of 'slow fashion' based on the passage.
Correct Answer: Are of high quality and long lasting.
The passage suggests that buying high-quality items that last longer could combat environmental issues, implying these are characteristics of 'slow fashion.'
Incorrect Answers:
Sold by genuine vintage stores: Not specifically mentioned as a feature of 'slow fashion.'
Do not shed microfibres: While desirable, not directly linked to the concept of 'slow fashion' in the passage.
Do not bleed toxins and dyes: Also desirable, but not directly tied to 'slow fashion' in the passage.

Question Numbers (13 to 16): The passage below is accompanied by four questions. Based on the passage, choose the best answer for each question.

Umberto Eco, an Italian writer, was right when he said the language of Europe is translation. Netflix and other deep-pocketed global firms speak it well. Just as the EU employs a small army of translators and interpreters to turn intricate laws or impassioned speeches of Romanian MEPs into the EU's 24 official languages, so do the likes of Netflix. It now offers dubbing in 34 languages and subtitling in a few more….

The economics of European productions are more appealing, too. American audiences are more willing than before to give dubbed or subtitled viewing a chance. This means shows such as "Lupin", a French crime caper on Netflix, can become global hits…. In 2015, about 75% of Netflix's original content was American; now the figure is half, according to Ampere, a media-analysis company. Netflix has about 100 productions under way in Europe, which is more than big public broadcasters in France or Germany….

Not everything works across borders. Comedy sometimes struggles. Whodunits and bloodthirsty maelstroms between arch Romans and uppity tribesmen have a more universal appeal. Some do it better than others. Barbarians aside, German television is not always built for export, says one executive, being polite. A bigger problem is that national broadcasters still dominate. Streaming services, such as Netflix or Disney+, account for about a third of all viewing hours, even in markets where they are well-established. Europe is an ageing continent. The generation of teens staring at phones is outnumbered by their elders who prefer to gawp at the box.

In Brussels and national capitals, the prospect of Netflix as a cultural hegemon is seen as a threat. "Cultural sovereignty" is the watchword of European executives worried that the Americans will eat their lunch. To be fair, Netflix content sometimes seems stuck in an uncanny valley somewhere in the mid-Atlantic, with local quirks stripped out. Netflix originals tend to have fewer specific cultural references than shows produced by domestic rivals, according to Enders, a market analyst. The company used to have an imperial model of commissioning, with executives in Los Angeles cooking up ideas French people might like. Now Netflix has offices across Europe. But ultimately the big decisions rest with American executives. This makes European politicians nervous.

They should not be. An irony of European integration is that it is often American companies that facilitate it. Google Translate makes European newspapers comprehensible, even if a little clunky, for the continent's non-polyglots. American social-media companies make it easier for Europeans to talk politics across borders. (That they do not always like to hear what they say about each other is another matter.) Now Netflix and friends pump the same content into homes across a continent, making culture a cross-border endeavour, too. If Europeans are to share a currency, bail each other out in times of financial need and share vaccines in a pandemic, then they need to have something in common—even if it is just bingeing on the same series. Watching fictitious northern and southern Europeans tear each other apart 2,000 years ago beats doing so in reality.

13. Based on information provided in the passage, all of the following are true, EXCEPT:
   1. only half of Netflix's original programming in the EU is now produced in America.
   2. Netflix has been able to transform itself into a truly European entity.
   3. European television productions have the potential to become global hits.
   4. national broadcasters dominate in the EU in terms of total television viewing hours.

14. Which one of the following research findings would weaken the author's conclusion in the final paragraph?
   1. Research shows that Netflix hits produced in France are very popular with North American audiences.
   2. Research shows that older women across the EU enjoy watching romantic comedies on Netflix, whereas younger women prefer historical fiction dramas.
   3. Research shows there is a wide variance in the popularity and viewing of Netflix shows across different EU countries.
   4. Research shows that Netflix has been gradually losing market share to other streaming television service providers.

15. Based only on information provided in the passage, which one of the following hypothetical Netflix shows would be most successful with audiences across the EU?
   1. An Italian comedy show hosted by an international star.
   2. A trans-Atlantic romantic drama set in Europe and America.
   3. A murder mystery drama set in North Africa and France.
   4. An original German TV science fiction production.

16. The author sees the rise of Netflix in Europe as:
   1. a looming cultural threat.
   2. an economic threat.
   3. a unifying force.
   4. filling an entertainment gap.

Sol.: For questions 13 to 16:

Passage Explanation (Paragraph-wise):
Paragraph 1: Discusses the role of translation in Europe, comparing the European Union's translation efforts to those of companies like Netflix. Netflix offers content in multiple languages through dubbing and subtitling, reflecting the linguistic diversity of Europe.

Paragraph 2: Explains the economics of European productions and their appeal to American audiences. There's a shift from primarily American content to a more balanced offering, with Netflix investing heavily in European productions.

Paragraph 3: Addresses the challenges of content translation and cultural adaptability. Certain genres like comedy may struggle across borders, while others like historical dramas have universal appeal. The paragraph also touches on the dominance of national broadcasters in Europe.

Paragraph 4: Discusses the perception of Netflix as a cultural hegemon in Europe, highlighting concerns about cultural sovereignty and the homogenization of content. It notes Netflix's shift from an imperial commissioning model to a more localized approach, though major decisions are still made by American executives.

Paragraph 5: Argues that American companies like Netflix and Google have facilitated European integration. The passage suggests that shared cultural experiences, such as watching the same series, can contribute to a sense of common identity among Europeans.

13. 2 **Question Explanation:** Seeks to identify the statement that is not true based on the information provided in the passage.
Correct Answer: Netflix has been able to transform itself into a truly European entity.
The passage does not suggest that Netflix has become a truly European entity. It still makes major decisions through American executives, indicating it retains a largely American perspective.
Incorrect Answers:
1. **Only half of Netflix's original programming in the EU is now produced in America:** Supported by the passage mentioning the shift in content.
3. **European television productions can become global hits:** Validated by the example of "Lupin."
4. **National broadcasters dominate in the EU:** Stated in the passage regarding the viewing habits in Europe.

14. 3 **Question Explanation:** Asks which research finding would weaken the author's conclusion in the final paragraph.
Correct Answer: Research shows there is a wide variance in the popularity and viewing of Netflix shows across different EU countries.
If there's wide variance in popularity across EU countries, it undermines the idea of shared cultural experiences fostering European integration.
Incorrect Answers:
1. Netflix hits popular in North America: Aligns with the passage's mention of European shows' global appeal.
2. Older women's viewing preferences: Does not directly counter the passage's conclusion about cultural integration.
4. Netflix losing market share: Doesn't directly address the cultural impact or unifying role of Netflix content in Europe.

15. 3 **Question Explanation:** Asks which hypothetical Netflix show would be most successful across the EU based on the passage.
Correct Answer: A murder mystery drama set in North Africa and France.
The passage notes the universal appeal of certain genres like historical dramas and murder mysteries, making this option the most likely to succeed across different cultures.
Incorrect Answers:
1. **Italian comedy:** Comedy struggles across borders, as mentioned in the passage.
2. **Trans-Atlantic romantic drama:** Not specifically aligned with the passage's emphasis on universally appealing genres.
4. **German TV science fiction:** German television is noted as not always being built for export, except for notable exceptions.

16. 3 **Question Explanation:** Inquires about the author's perspective on the rise of Netflix in Europe.
Correct Answer: A unifying force.
The passage suggests that Netflix, by providing shared content across Europe, is contributing to cultural integration and a sense of common identity.
Incorrect Answers:
1. **Looming cultural threat:** The passage does not portray Netflix as a threat but as an integrative force.
2. **Economic threat:** The economic aspect is not the focus of the passage.
4. **Filling an entertainment gap:** Oversimplifies the passage's view of Netflix's role in cultural integration.

17. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide where (option 1, 2, 3, or 4) the following sentence would best fit.

Sentence: And probably much earlier, moving the documentation for kissing back 1,000 years compared to what was acknowledged in the scientific community.

Paragraph: Research has hypothesised that the earliest evidence of human lip kissing originated in a very specific geographical location in South Asia 3,500 years ago.___(1)___. From there it may have spread to other regions, simultaneously accelerating the spread of the herpes simplex virus 1. According to Dr Troels Pank Arbøll and Dr Sophie Lund Rasmussen, who in a new article in the journal Science draw on a range of written sources from the earliest Mesopotamian societies, kissing was already a well-established practice 4,500 years ago in the Middle East.___(2)___. In ancient Mesopotamia, people wrote in cuneiform script on clay tablets.___(3)___. Many thousands of these clay tablets have survived to this day, and they contain clear examples that kissing was considered a part of romantic intimacy in ancient times.___(4)___. "Kissing could also have been part of friendships and family members' relations," says Dr Troels Pank Arbøll, an expert on the history of medicine in Mesopotamia.

1. Option 2
2. Option 1
3. Option 3
4. Option 4

17. 1

Sol.: Sentence Placement in Paragraph

Given Sentence: "And probably much earlier, moving the documentation for kissing back 1,000 years compared to what was acknowledged in the scientific community."

Paragraph Structure:
Earliest evidence of human lip kissing originated in South Asia 3,500 years ago.
Spread to other regions and accelerating the spread of herpes simplex virus 1.
Dr. Troels Pank Arbøll and Dr. Sophie Lund Rasmussen's study on Mesopotamian societies.
Cuneiform script on clay tablets in Mesopotamia.
Examples of kissing as part of romantic intimacy in ancient times.

Analysis:
Before Blank 1: Discusses the origin of kissing in South Asia.
Before Blank 2: Mentions the spread of kissing and its consequences.
Before Blank 3: Introduces researchers and their study.
Before Blank 4: Describes the medium of documentation (clay tablets).

Option 2: The given sentence fits best before Blank 2 because it provides a transitional context between the origin of kissing in South Asia and its documented existence in Mesopotamia. It bridges the gap by suggesting that kissing was practiced even earlier than previously thought (in Mesopotamia, 4,500 years ago), which is crucial information before introducing the researchers' study on Mesopotamian societies.

Incorrect Answers:
Option 1: Placing the sentence here would disrupt the flow by introducing the idea of an earlier origin before establishing the basic premise of kissing's origin in South Asia.
Option 3: Here, the sentence would be out of context as it interrupts the introduction of the researchers and their work.
Option 4: This placement would be too late, as it should logically precede the specifics about Mesopotamian documentation.

18. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide where (option 1, 2, 3, or 4) the following sentence would best fit.

Sentence: Dualism was long held as the defining feature of developing countries in contrast to developed countries, where frontier technologies and high productivity were assumed to prevail.

Paragraph: ___(1)___. At the core of development economics lies the idea of 'productive dualism': that poor countries' economies are split between a narrow 'modern' sector that uses advanced technologies and a larger 'traditional' sector characterized by very low productivity.___(2)___. While this distinction between developing and advanced economies may have made some sense in the 1950s and 1960s, it no longer appears to be very relevant. A combination of forces have produced a widening gap between the winners and those left behind.___(3)___. Convergence between poor and rich parts of the economy was arrested and regional disparities

widened.___(4)___. As a result, policymakers in advanced economies are now grappling with the same questions that have long preoccupied developing economies: mainly how to close the gap with the more advanced parts of the economy.

1. Option 1
2. Option 2
3. Option 3
4. Option 4

18. 2

Sol.: Sentence Placement in Paragraph

Given Sentence: "Dualism was long held as the defining feature of developing countries in contrast to developed countries, where frontier technologies and high productivity were assumed to prevail."

Paragraph Structure:
Introduction to the idea of 'productive dualism' in development economics.
Distinction between developing and advanced economies in the 1950s and 1960s.
Forces leading to economic disparities and widening gaps.
Policymakers grappling with similar issues in advanced economies.

Analysis:
The paragraph talks about the concept of 'productive dualism' at the core of development economics, where poor countries have economies split between a 'modern' sector and a 'traditional' sector. The paragraph then mentions that this distinction between developing and advanced economies, which was relevant in the past, is no longer very relevant due to various forces leading to a widening gap between winners and those left behind. The missing sentence should logically connect these ideas and explain the consequences of this widening gap.

Option 2: This option talks about the consequences of the widening gap, stating that convergence was arrested, and regional disparities widened. This fits well with the context and provides a logical flow from the previous sentence.

Incorrect Answers:
Option 1: The sentence doesn't connect well with the previous sentence. It talks about convergence and regional disparities but doesn't smoothly follow the idea of the widening gap.
Option 3: This sentence seems to introduce a new idea about policymakers in advanced economies grappling with questions, and it doesn't directly connect with the previous sentence.
Option 4: This option talks about policymakers in advanced economies but doesn't provide a smooth transition from the previous sentence about the widening gap.

19. Five jumbled up sentences (labelled 1, 2, 3, 4 and 5), related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd sentence and key in the number of that sentence as your answer.
    1. The banning of Northern Lights could be considered a precursor to censoring books for "moral", world view or religious reasons.
    2. Attempts to ban books are attempts to silence authors who have summoned immense courage in telling their stories.
    3. Now the banning and challenging of books in the US has escalated to an unprecedented level.
    4. The widely acclaimed fantasy novel Northern Lights was banned in some parts of the US, and was the second most challenged book in the US.
    5. The American Library Association documented an unparalleled number of reported book challenges in 2022, about 2,500 unique titles.

19. 2

Sol.: Identifying the Odd Sentence

Sentences:
1. The banning of Northern Lights could be considered a precursor to censoring books for "moral", world view or religious reasons.

2. Attempts to ban books are attempts to silence authors who have summoned immense courage in telling their stories.
3. Now the banning and challenging of books in the US has escalated to an unprecedented level.
4. The widely acclaimed fantasy novel Northern Lights was banned in some parts of the US, and was the second most challenged book in the US.
5. The American Library Association documented an unparalleled number of reported book challenges in 2022, about 2,500 unique titles.

Explanation: Sentence 2 is the odd one out. It focuses on the broader theme of silencing authors, which, while relevant to the topic of book banning, does not fit the specific narrative flow established by the other sentences about the escalation of book banning and specific examples (like "Northern Lights").

Logical Sequence of Other Sentences:

$3 \rightarrow 5 \rightarrow 4 \rightarrow 1$: These sentences form a coherent narrative about the increasing trend of book banning in the US, with specific reference to the case of "Northern Lights" and its historical context as a precursor to current trends.

20. Five jumbled up sentences (labelled 1, 2, 3, 4 and 5), related to a topic, are given below. Four of them can be put together to form a coherent paragraph. Identify the odd sentence and key in the number of that sentence as your answer.
    1. Self-care particularly links to loneliness, behavioural problems, and negative academic outcomes.
    2. "Latchkey children" refers to children who routinely return home from school to empty homes and take care of themselves for extended periods of time.
    3. Although self-care generally points to negative outcomes, it is important to consider that the bulk of research has yet to track long-term consequences.
    4. In research and practice, the phrase "children in self-care" has come to replace latchkey in an effort to more accurately reflect the nature of their circumstances.
    5. Although parents might believe that self-care would be beneficial for development, recent research has found

20. 3

Sol.: Identifying the Odd Sentence

Sentences:
1. Self-care particularly links to loneliness, behavioural problems, and negative academic outcomes.
2. "Latchkey children" refers to children who routinely return home from school to empty homes and take care of themselves for extended periods of time.
3. Although self-care generally points to negative outcomes, it is important to consider that the bulk of research has yet to track long-term consequences.
4. In research and practice, the phrase "children in self-care" has come to replace latchkey in an effort to more accurately reflect the nature of their circumstances.
5. Although parents might believe that self-care would be beneficial for development, recent research has found quite the opposite.

Explanation: Sentence 3 is the odd one out. It introduces a qualifier about the lack of long-term research on the outcomes of self-care, which is a slight deviation from the other sentences' focus on defining "latchkey children," explaining the terminology evolution, and discussing the impacts of self-care.

Logical Sequence of Other Sentences:

$2 \rightarrow 4 \rightarrow 5 \rightarrow 1$: These sentences provide a coherent narrative about "latchkey children," the evolution of the term to "children in self-care," and the associated negative outcomes, both perceived and researched.

21. The four sentences (labelled 1, 2, 3 and 4) given below, when properly sequenced, would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer.
    1. Contemporary African writing like 'The Bottled Leopard' voices this theme using two children and two backgrounds to juxtapose two varying cultures.
    2. Chukwuemeka Ike explores the conflict, and casts the Western tradition as condescending, enveloping and unaccommodating towards local African practice.

3. However, their views contradict the reality, for a rich and sustaining local African cultural ethos exists for all who care, to see and experience.
4. Western Christian concepts tend to deny or feign ignorance about the existence of a genuine and enduring indigenous African tradition.

21. 4321

Sol.: Proper Sequencing of Sentences

Sentences:
1. Contemporary African writing like 'The Bottled Leopard' voices this theme using two children and two backgrounds to juxtapose two varying cultures.
2. Chukwuemeka Ike explores the conflict, and casts the Western tradition as condescending, enveloping and unaccommodating towards local African practice.
3. However, their views contradict the reality, for a rich and sustaining local African cultural ethos exists for all who care, to see and experience.
4. Western Christian concepts tend to deny or feign ignorance about the existence of a genuine and enduring African tradition.

Analysis of Correct Sequence (4321):

4 as the Starting Statement: This sets the stage by presenting a general statement about Western Christian concepts' denial of African traditions. It establishes the context of cultural conflict.

3 as the Next Statement: This builds on the conflict introduced in Sentence 4 by contrasting the Western views with the reality of rich African cultural traditions.

2 as the Following Statement: Now that the conflict and reality are established, Sentence 2 introduces Chukwuemeka Ike, who explores this specific conflict in his work, providing an example of the general theme introduced earlier.

1 as the Concluding Statement: Sentence 1 talks about a specific work, 'The Bottled Leopard,' which illustrates the previously discussed themes and conflict, making it a fitting conclusion to the sequence.

22. The four sentences (labelled 1, 2, 3 and 4) given below, when properly sequenced, would yield a coherent paragraph. Decide on the proper sequencing of the order of the sentences and key in the sequence of the four numbers as your answer.
1. Like the ants that make up a colony, no single neuron holds complex information like self-awareness, hope or pride.
2. Although the human brain is not yet understood enough to identify the mechanism by which emergence functions, most neurobiologists agree that complex interconnections among the parts give rise to qualities that belong only to the whole.
3. Nonetheless, the sum of all neurons in the nervous system generate complex human emotions like fear and joy, none of which can be attributed to a single neuron.
4. Human consciousness is often called an emergent property of the human brain.

22. 4132

Sol.: Proper Sequencing of Sentences

Sentences:
1. Like the ants that make up a colony, no single neuron holds complex information like self-awareness, hope or pride.
2. Although the human brain is not yet understood enough to identify the mechanism by which emergence functions, most neurobiologists agree that complex interconnections among the parts give rise to qualities that belong only to the whole.
3. Nonetheless, the sum of all neurons in the nervous system generates complex human emotions like fear and joy, none of which can be attributed to a single neuron.
4. Human consciousness is often called an emergent property of the human brain.

Analysis of Correct Sequence (4132):
4 as the Starting Statement: This introduces the concept of human consciousness as an emergent property, setting the theme for the discussion on how complex properties emerge from simpler elements.
1 as the Next Statement: This provides a metaphor (ants in a colony) to explain the concept introduced in Sentence 4, illustrating how individual components (neurons, like ants) contribute to a larger, complex system (consciousness, like the colony).
3 as the Following Statement: Building on the metaphor, this sentence dives deeper into the specifics of how the collective of neurons results in complex emotions, aligning with the theme of emergence.
2 as the Concluding Statement: Sentence 2 wraps up by acknowledging the current limits of understanding in neuroscience regarding the mechanism of emergence, while reiterating the consensus on the significance of complex interconnections.

23. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

People spontaneously create counterfactual alternatives to reality when they think "if only" or "what if" and imagine how the past could have been different. The mind computes counterfactuals for many reasons. Counterfactuals explain the past and prepare for the future, they implicate various relations including causal ones, and they affect intentions and decisions. They modulate emotions such as regret and relief, and they support moral judgments such as blame. The ability to create counterfactuals develops throughout childhood and contributes to reasoning about other people's beliefs, including their false beliefs.

1. Counterfactuals help people to prepare for the future by understanding intentions and making decisions.
2. Counterfactual thinking helps to reverse past and future actions and reason out false beliefs.
3. People create counterfactual alternatives to reality for various reasons, including reasoning about other people's beliefs.
4. Counterfactual alternatives to reality are created for a variety of reasons and is part of one's developmental process.

23. 4

Sol.: Summary of the Passage

Passage Analysis:
Sentence 1: People spontaneously create counterfactual alternatives to reality when they think "if only" or "what if".
Explanation: Introduction to the concept of counterfactual thinking.
Sentence 2: The mind computes counterfactuals for many reasons: explaining the past, preparing for the future, implicating various relations including causal ones, and affecting intentions and decisions.
Explanation: Elaboration of the purposes and impacts of counterfactual thinking.
Sentence 3: They modulate emotions such as regret and relief, and they support moral judgments such as blame.
Explanation: Further explanation of how counterfactuals influence emotions and moral reasoning.
Sentence 4: The ability to create counterfactuals develops throughout childhood and contributes to reasoning about other people's beliefs, including their false beliefs.
Explanation: Highlighting the developmental aspect of counterfactual thinking and its role in understanding others' perspectives.
Passage Summary: Counterfactual thinking involves imagining alternative realities.
It serves multiple purposes: explaining past events, preparing for future scenarios, influencing emotions, and moral reasoning.
It's a developmental skill that helps in understanding others' beliefs.
Explanation: This summary encapsulates the essence of the passage, covering the variety of reasons people create counterfactual alternatives and their developmental aspect.
Incorrect Options Analysis:
Option 1: Too narrow; focuses only on future preparation and decision-making, missing other aspects.
Option 2: Misrepresents the concept; counterfactuals don't reverse actions but imagine alternatives.
Option 3: Omits the developmental aspect and the variety of reasons for counterfactual thinking.

24. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.

Heatwaves are becoming longer, frequent and intense due to climate change. The impacts of extreme heat are unevenly experienced; with older people and young children, those with pre-existing medical conditions and on low incomes significantly more vulnerable. Adaptation to heatwaves is a significant public policy concern. Research conducted among at-risk people in the UK reveals that even vulnerable people do not perceive themselves as at risk of extreme heat; therefore, early warnings of extreme heat events do not perform as intended. This suggests that understanding how extreme heat is narrated is very important. The news media play a central role in this process and can help warn people about the potential danger, as well as about impacts on infrastructure and society.

1. Heatwaves pose an enormous risk; the media plays a pivotal role in alerting people to this danger.
2. People are vulnerable to heatwaves caused due to climate change, measures taken are ineffective.
3. Protection from heat waves is important but current reports and public policies seem ineffective.
4. News stories help in warning about heatwaves, but they have to become more effective.

24. 1

Sol.: Summary of the Passage

Passage Analysis:
Sentence 1: Heatwaves are becoming longer, frequent, and intense due to climate change.
Explanation: Statement about the increasing severity of heatwaves.
Sentence 2: Impacts of extreme heat are unevenly experienced; vulnerable groups are more affected.
Explanation: Highlighting the disproportionate impact of heatwaves on vulnerable populations.
Sentence 3: Adaptation to heatwaves is a significant public policy concern.
Explanation: Emphasizing the importance of heatwave adaptation in policy.
Sentence 4: Vulnerable people do not perceive themselves as at risk; early warnings are ineffective.
Explanation: Pointing out a gap in perception and the ineffectiveness of current measures.
Understanding how extreme heat is narrated is very important; the media plays a central role.
Stressing the importance of communication and media in addressing heatwave awareness.
Main Points:
Increased intensity of heat waves due to climate change.
Disproportionate impact on vulnerable groups.
Ineffective current warning systems and the crucial role of media in raising awareness.
Explanation: This summary accurately captures the key points: the rising threat of heatwaves, the role of media, and the importance of raising public awareness.
Incorrect Options Analysis:
Option 2: Overlooks the role of media; focuses only on vulnerability and ineffective measures.
Option 3: Misses the emphasis on the media's role; focuses on policy and protection inadequacy.
Option 4: Understates the passage's focus on climate change's role in heatwaves; overemphasizes the need for media improvement.

Question Numbers (1 to 5): There are nine boxes arranged in a 3 × 3 array as shown in Tables 1 and 2. Each box contains three sacks. Each sack has a certain number of coins, between 1 and 9, both inclusive.

The average number of coins per sack in the boxes are all distinct integers. The total number of coins in each row is the same. The total number of coins in each column is also the same.

	1st column	2nd column	3rd column			1st column	2nd column	3rd column
1st row		9	6		1st row	1**	2*	2*
2nd row	2				2nd row	1**	0*	3*
3rd row	8				3rd row	3*	2**	0**

<div style="text-align:center">Table 1   Table 2</div>

Table 1 gives information regarding the median of the numbers of coins in the three sacks in a box for some of the boxes. In Table 2 each box has a number which represents the number of sacks in that box having more than 5 coins. That number is followed by a * if the sacks in that box satisfy exactly one among the following three conditions, and it is followed by ** if two or more of these conditions are satisfied.

i) The minimum among the numbers of coins in the three sacks in the box is 1.

ii) The median of the numbers of coins in the three sacks is 1.

iii) The maximum among the numbers of coins in the three sacks in the box is 9.

1. What is the total number of coins in all the boxes in the 3rd row?
   1. 45
   2. 36
   3. 30
   4. 15

2. How many boxes have at least one sack containing 9 coins?
   1. 4
   2. 8
   3. 3
   4. 5

3. For how many boxes are the average and median of the numbers of coins contained in the three sacks in that box the same?

4. How many sacks have exactly one coin?

5. In how many boxes do all three sacks contain different numbers of coins?

Sol.: For questions 1 to 5:

Step 1:

It is given that average number of coins per sack in the boxes are all distinct integers, so, each box will have average of 1, 2, 3, 4, 5, 6, 7, 8 and 9 coins per sack in any order.

Therefore, each row and column will have $\dfrac{9 \times 10}{2} = 45$ coins in total, since each row and column has same number of coins.

Also, since average number of coins per sack is an integer value therefore, the sum of coins in each sack in a box should be divisible by 3.

Average of '1' is only possible for the combination of (1, 1, 1). This combination is possible for boxes in 3rd column - 3rd row because this satisfies 2 conditions that minimum value is 1 and median is also 1.

Average '9' is only possible for the combination of (9, 9, 9). This combination is possible in 2nd row-3rd column (Box in 3rd row 1st column has median 8, therefore, it cannot have an average value of 9).

Box in 3rd row - 1st column satisfies condition (iii) only therefore, the only combination of coins that satisfies the mentioned condition is (7, 8, 9).

Box in 3rd row/2nd column must satisfy conditions (i) and (iii). So, minimum and maximum number of coins in a bag are 1, and 9 respectively.

Hence, possible combinations are (1, 5, 9) or (1, 8, 9) but only (1, 8, 9) will give the sum of 45 for Row-3

	1st column	2nd column	3rd column
3rd row	7, 8, 9	1, 8, 9	1, 1, 1
	(Av(8))	(Av(6))	(Av(1))

Step 2:

If average number of coins in a box is '2' then, total sum of coins is suppose to be 6 which means each sack must have less than 5 coins and that is only possible for box in 2nd row - 2nd column.

This box satisfy only one condition and that must be (i).

Hence, the only possible combination is (1, 2, 3).

[We take (1, 1, 4) then two given conditions will be satisfied which contradicts.]

	1st column	2nd column	3rd column
2nd row	1, 2, 9	1, 2, 3	9, 9, 9
	(Av(4))	(Av(2))	(Av(9))

Similarly,

	1st column	2nd column	3rd column
1st row	1, 1, 7	3, 9, 9	1, 6, 8

1. 1 The total number of coins in all the boxes in the 3rd row is 45.

2. 4 5 boxes have atleast one sack containing 9 coins.

3. 4 4 boxes

4. 9 9 sacks have exactly 1 coin.

5. 5 5 boxes contain sacks with each sack containing different number of coins.

Question Numbers (6 to 10): Three participants – Akhil, Bimal and Chatur participate in a random draw competition for five days. Every day, each participant randomly picks up a ball numbered between 1 and 9. The number on the ball determines his score on that day. The total score of a participant is the sum of his scores attained in the five days. The total score of a day is the sum of participants' scores on that day. The 2-day average on a day, except on Day 1, is the average of the total scores of that day and of the previous day. For example, if the total scores of Day 1 and Day 2 are 25 and 20, then the 2-day average on Day 2 is calculated as 22.5. Table 1 gives the 2-day averages for Days 2 through 5.

Table 1: 2-day averages for Days 2 through 5

Day 2	Day 3	Day 4	Day 5
15	15.5	16	17

Participants are ranked each day, with the person having the maximum score being awarded the minimum rank (1) on that day. If there is a tie, all participants with the tied score are awarded the best available rank. For example, if on a day Akhil, Bimal, and Chatur score 8, 7 and 7 respectively, then their ranks will be 1, 2 and 2 respectively on that day. These ranks are given in Table 2.

Table 2: Ranks of participants on each day

	Day 1	Day 2	Day 3	Day 4	Day 5
Akhil	1	2	2	3	3
Bimal	2	3	2	1	1
Chatur	3	1	1	2	2

The following information is also known.

1. Chatur always scores in multiples of 3. His score on Day 2 is the unique highest score in the competition. His minimum score is observed only on Day 1, and it matches Akhil's score on Day 4.
2. The total score on Day 3 is the same as the total score on Day 4.
3. Bimal's scores are the same on Day 1 and Day 3.

6. What is Akhil's score on Day 1?
   1. 6
   2. 5
   3. 7
   4. 8

7. Who attains the maximum total score?
   1. Akhil
   2. Chatur
   3. Cannot be determined
   4. Bimal

8. What is the minimum possible total score of Bimal?

9. If the total score of Bimal is a multiple of 3, what is the score of Akhil on Day 2?

1. 5
2. Cannot be determined
3. 4
4. 6

10. If Akhil attains a total score of 24, then what is the total score of Bimal?

Sol.: For questions 6 to 10:

Step 1:

Let total score of Day 1, Day 2, Day 3, Day 4 and Day 5 be D1, D2, D3, D4 and D5 respectively.

Then, D1 + D2 = 30

        D2 + D3 = 31

        D3 + D4 = 32

        D4 + D5 = 34

As per condition 2, D3 = D4 = 16

Therefore, D1 = 15, D2 = 15, D3 = 16, D4 = 16 and D5 = 18.

As per condition 1 and 3,

	Day 1	Day 2	Day 3	Day 4	Day 5
Akhil			a	b	
Bimal	a		a		
Chatur	b		c		
Total	15	15	16	16	18

So, $2a + c = 16$, where $c > a$. Therefore, possible combinations are (4, 8), (5, 6) but since all scores of Chatur were multiples of 3, hence, $(a, c) = (5, 6)$. This also implies Chatur's unique highest score in the competition on Day 2 must be 9 and $b = 3$.

Step 2:

	Day 1	Day 2	Day 3	Day 4	Day 5
Akhil	7	x	5	3	p
Bimal	5	y	5	7	q
Chatur	3	9	6	6	6
Total	15	15	16	16	18

Here $9 > x > y$ and $q > 6 > p$

and $x + y = 6$ and $p + q = 12$

Possible combinations of $(x, y) = (15, 1), (4, 2)$

Possible combinations of $(p, q) = (5, 7), (4, 8)$

6. 3 Akhil's score on Day 1 is 7.

7. 2 Chatur attains the maximum total score.

8. 25 25 is the minimum possible total score of Bimal when y = 1 and q = 7.

9. 3 Total score of Bimal is a multiple of 3 when y = 2 and q = 8. Then, score of Akhil on Day 2 will be 4.

10. 26 Total score of Bimal will be 26.

Question Numbers (11 to 15): Odsville has five firms – Alfloo, Bzygoo, Czechy, Drjbna and Elavalaki. Each of these firms was founded in some year and also closed down a few years later.

Each firm raised Rs. 1 crore in its first and last year of existence. The amount each firm raised every year increased until it reached a maximum, and then decreased until the firm closed down. No firm raised the same amount of money in two consecutive years. Each annual increase and decrease was either by Rs. 1 crore or by Rs. 2 crores.

The table below provides partial information about the five firms.

Firm	First year of existence	Last year of existence	Total amount raised (Rs. crores)
Alfloo	2009	2016	21
Bzygoo	2012	2015	
Czechy	2013		9
Drjbna	2011	2015	10
Elavalaki	2010		13

11. For which firm(s) can the amounts raised by them be concluded with certainty in each year?
   1. Only Bzygoo and Czechy and Drjbna
   2. Only Drjbna
   3. Only Czechy and Drjbna
   4. Only Czechy

12. What best can be concluded about the total amount of money raised in 2015?
   1. It is either Rs. 7 crores or Rs. 8 crores.
   2. It is either Rs. 8 crores or Rs. 9 crores.
   3. It is exactly Rs. 8 crores.
   4. It is either Rs. 7 crores or Rs. 8 crores or Rs. 9 crores.

13. What is the largest possible total amount of money (in Rs. crores) that could have been raised in 2013?

14. If Elavalaki raised Rs. 3 crores in 2013, then what is the smallest possible total amount of money (in Rs. crores) that could have been raised by all the companies in 2012?
   1. 9   2. 11
   3. 12   4. 10

15. If the total amount of money raised in 2014 is Rs. 12 crores, then which of the following is not possible?

1. Alfloo raised the same amount of money as Bzygoo in 2014.
2. Alfloo raised the same amount of money as Drjbna in 2013.
3. Bzygoo raised the same amount of money as Elavalaki in 2013.
4. Bzygoo raised more money than Elavalaki in 2014.

Sol.: For questions 11 to 15:

11. 3 Let us try to find the amount of money raised by a firm:

Bzygoo:

		2012	2013	2014	2015
Case 1	Amount Raised	1	2	3	1
Case 2	(in crores)	1	3	2	1

Czechy:

	2013	214	2015	2016	2017
Amount Raised (in crores)	1	a	b	c	1

Here, a + b + c = 9 − 2 = 7.

Only possible combination is (a, b, c) = (2, 3, 2).

(Note: Other possibility of last year of existence is not there as it will not add up to 7.)

Drjbna:

	2011	2012	2013	2014	2015
Amount Raised (in crores)	1	2	4	2	1

For firms Czechy and Drjbna only, exact amounts raised by them can be concluded.

12. 1 Let us try to calculate possible amounts of money raised by firms Alfloo and Elavalaki.

Firm Alfloo:

2009	2010	2011	2012	2013	2014	2015	2016
1	3	4	5	4	3	2	1

This is the least possible money raised if in 2010 money raised increased by 2 crores. Here, the total sum is 23. So this case is not possible. Therefore, in 2010 money raised must increase by 1 crore.

	2009	2010	2011	2012	2013	2014	2015	2016
Case 1	1	2	3	4	5	3	2	1
Case 2	1	2	3	5	4	3	2	1

(Note: Again if money raised in 2011 is '4' then least possible sum is 22 for combination 1-2-4-5-4-3-2-1)

Firm Elavalaki:

Case 1	2010	2011	2012	2013	2014	2015
Sub case 1	1	2	3	4	2	1
Sub case 2	1	2	4	3	2	1

Case 2	2010	2011	2012	2013	2014
	1	3	5	3	1

Hence, the money raised in year 2015 can be:

2 + 1 + 3 + 1 + 1 or 0 = 7 or 8 crores.

13. 17 The largest possible total amount of money (in Rs. crores) that could have been raised in 2013.

Alfloo	Bzygoo	Czechy	Drijbna	Elavalaki
5	3	1	4	4

Hence, the total money raised = 17 crores.

14. 2 If Elavalaki raised Rs. 3 crore in 2013, then these cases are considered.

	2010	2011	2012	2013	2014	2015
Case 1	1	3	5	3	1	0
Case 2	1	2	4	3	2	1

Now the smallest possible amount of money that could have been raised by all the companies in 2012 is 4 + 1 + 0 + 2 + 4 = 11 crores.

15. 3 If the total amount of money raised in 2014 is Rs. 12 crores, then

	2009	2010	2011	2012	2013	2014	2015	2016	2017
Alfloo	1	2	3	4/5	5/4	3	2	1	
Bzygoo				1	2/3	3/2	1		
Czechy					1	2	3	2	1
Drjbna			1	2	4	2	1		
Elavalaki		1			4/3	2/1			1
						12			

Hence, statement "Bzygoo raised the same amount of money as Elavalaki in 2013" is not possible.

Question Numbers (16 to 20): Anjali, Bipasha, and Chitra visited an entertainment park that has four rides. Each ride lasts one hour and can accommodate one visitor at one point. All rides begin at 9 am and must be completed by 5 pm except for Ride-3, for which the last ride has to be completed by 1 pm. Ride gates open every 30 minutes, e.g. 10 am, 10:30 am, and so on. Whenever a ride gate opens, and there is no visitor inside, the first visitor waiting in the queue buys the ticket just before taking the ride. The ticket prices are Rs. 20, Rs. 50, Rs. 30 and Rs. 40 for Rides 1 to 4, respectively. Each of the three visitors took at least one ride and did not necessarily take all rides. None of them took the same ride more than once. The movement time from one ride to another is negligible, and a visitor leaves the ride immediately after the completion of the ride. No one takes a break inside the park unless mentioned explicitly.

The following information is also known.

1. Chitra never waited in the queue and completed her visit by 11 am after spending Rs. 50 to pay for the ticket(s).
2. Anjali took Ride-1 at 11 am after waiting for 30 mins for Chitra to complete it. It was the only ride where Anjali waited.

3. Bipasha began her first of three rides at 11:30 am. All three visitors incurred the same amount of ticket expense by 12:15 pm.

4. The last ride taken by Anjali and Bipasha was the same, where Bipasha waited 30 mins for Anjali to complete her ride. Before standing in the queue for that ride, Bipasha took a 1-hour coffee break after completing her previous ride.

16. What was the total amount spent on tickets (in Rs.) by Bipasha?
1. 90
2. 120
3. 100
4. 110

17. Which were all the rides that Anjali completed by 2:00 pm?
1. Ride-1, Ride-2, and Ride-3
2. Ride-1 and Ride-3
3. Ride-1, Ride-2, and Ride-4
4. Ride-1 and Ride-4

18. Which ride was taken by all three visitors?
1. Ride-4
2. Ride-3
3. Ride-2
4. Ride-1

19. How many rides did Anjali and Chitra take in total?

20. What was the total amount spent on tickets (in Rs.) by Anjali?

Sol.: For questions 16 to 20:

Step 1:

From condition (1) and (2), it can be concluded that Chitra did two rides - Ride 1 and Ride 3 at time 10 am to 11 am and 9 am to 10 am respectively since Anjali waited for 30 min to complete ride 1 which Anjali took at 11 am.

From condition (3), it can be concluded that Bipasha paid for one ride till 12:15, i.e., Ride 2 only from 11:30 to 12:30 and since Bipasha took 3 rides in total she must not have taken ride 3 as it closes at 1 pm.

	Ride 1	Ride 2	Ride 3	Ride 4
Anjali				
Bipasha		11:30 am to 12:30 pm	×	
Chitra	10:00 am to 11:00 am	×	9:00 am to 10:00 am	×

Step 2:

From condition (4), it can be concluded that the schedule of Bipasha must be

11:30 am to 12:30 pm (Ride 2)
↓
12:30 pm to 1:30 pm
↓
1:30 pm to 2:30 pm (Coffee Break)
↓
2:30 pm to 3 pm (waited)
↓
3 pm to 4 pm (Last Ride)

Since Bipasha waited from 2:30 pm to 3:00 pm for Anjali to complete the last ride, therefore her last ride got completed at 3 pm.

Final table looks like:

	Ride 1	Ride 2	Ride 3	Ride 4
Anjali	11:00 am to 12:00 pm	1:00 pm to 2:00 pm	12:00 pm to 1:00 pm	2:00 pm to 3:00 pm
Bipasha	12:30 pm to 1:30 pm	11:30 am to 12:30 pm	×	3:00 pm to 4:00 pm
Chitra	10 am to 11 am	×	9:00 am to 10:00 am	×

16. 4 Total amount spent on tickets (in Rs.) by Bipasha is Rs. 110.

17. 1 The rides that Anjali completed by 2 pm are Ride 1, Ride 2 and Ride 3.

18. 4 Ride 1 was taken by all three visitors.

19. 6 Anjali and Chitra take 6 Rides in total.

20. 140

The total amount spent on tickets by Anjali is Rs. 140.

Section III: QA

1. For any natural numbers m, n, and k, such that k divides both m + 2n and 3m + 4n, k must be a common divisor of

    1. m and n   2. m and 2n

    3. 2m and 3n   4. 2m and n

1. 2

Sol.: Given $k/_{m+2n}$, $k/_{3m+4n}$ where m, n and k are natural numbers.

Since $k/_{m+2n} \Rightarrow k/_{2m+4n}$

$\therefore$ $k/_{3m+4n} \Rightarrow k/_{m+(2m+4n)}$

$\Rightarrow k/_m$ and $k/_{2m+4n}$

From this we know, $k/_{m+2n} \Rightarrow k/_m$ and $k/_{2n}$

Hence, k must be a common divisor of m and 2n.

2. Any non-zero real numbers x, y such that $y \neq 3$ and $\dfrac{x}{y} < \dfrac{x+3}{y-3}$, will satisfy the condition

    1. If y > 10, then –x > y   2. If x < 0, then –x < y

    3. If y < 0, then –x < y   4. $\dfrac{x}{y} < \dfrac{y}{x}$

2. 3

Sol.: Consider the inequality $\dfrac{x}{y} < \dfrac{x+3}{y-3}$.

$\Rightarrow$ x(y – 3) < (x + 3) y (since, $x \neq 0$, $y \neq 0, 3$)

$\Rightarrow$ xy – 3x < xy + 3y

$\Rightarrow$ –x < y

For y < 0, –x < y < 0 holds true.

3. The sum of all possible values of x satisfying the equation $2^{4x^2} - 2^{2x^2+x+16} + 2^{2x+30} = 0$, is

    1. 3/2   2. 1/2

    3. 3   4. 5/2

3. 2

Sol.: Consider the equation:-

$$2^{4x^2} - 2^{2x^2+x+16} + 2^{2x+30} = 0$$

$$\Rightarrow \left(2^{2x^2}\right)^2 - 2^{2x^2}.2^{x+15}.2 + \left(2^{x+15}\right)^2 = 0$$

$$\Rightarrow \left(2^{2x^2} - 2^{x+15}\right)^2 = 0$$

$$\Rightarrow 2^{2x^2} - 2^{x+15} = 0$$

$$\Rightarrow 2x^2 = x + 15$$

$$\Rightarrow 2x^2 - x - 15 = 0$$

$$\Rightarrow 2x^2 - 6x + 5x - 15 = 0$$

$$\Rightarrow (2x + 5)(x - 3) = 0$$

Therefore, the possible values of x are $\dfrac{-5}{2}$ and 3 respectively.

Hence, the sum of the possible values $= \left(3 - \dfrac{5}{2}\right) = \dfrac{1}{2}$.

---

4. Let a, b, m and n be natural numbers such that a > 1 and b > 1. If $a^m b^n = 144^{145}$, then the largest possible value of n – m is

1. 289
2. 580
3. 290
4. 579

4. 4

Sol.: Given: $a^m b^n = 144^{145}$, where a, b, m, n are natural numbers such that a > 1, b > 1.

$144^{145} = 12^{145} \times 12^{145}$

$= 3^{290} \times 4^{145} \times 4^{145}$

$= 3^{290} \times 2^{580}$

Let b = 2, n = 580, a = 3^{290}, and m = 1.

Hence, n – m = 580 – 1 = 579.

---

5. For some positive real number x, if $\log_{\sqrt{3}}(x) + \dfrac{\log_x(25)}{\log_x(0.008)} = \dfrac{16}{3}$, then the value of $\log_3(3x^2)$ is

5. 7

Sol.: $\log_{\sqrt{3}} x + \dfrac{\log_x(25)}{\log_x(0.008)} = \dfrac{16}{3}$

$\Rightarrow \log_{\sqrt{3}} x + \dfrac{2\log 5}{3\log\dfrac{2}{10}} = \dfrac{16}{3}$

$\Rightarrow \log_{\sqrt{3}} x + \dfrac{2\log 5}{(-3)\log 5} = \dfrac{16}{3}$

$\Rightarrow \dfrac{2\log x}{\log 3} = \dfrac{18}{3} = 6$

$\Rightarrow \log x^2 = 6\log 3$

$\Rightarrow x^2 = 3^6$

So, $\log_3(3x^2) = \log_3(3.3^6)$

$= \log_3(3^7)$

$= 7$

6. Let k be the largest integer such that the equation $(x-1)^2 + 2kx + 11 = 0$ has no real roots. If y is a positive real number, then the least possible value of $\dfrac{k}{4y} + 9y$ is

6. 6

Sol.: The equation $(x-1)^2 + 2kx + 11 = 0$ has no real roots or

$\Rightarrow x^2 + 1 - 2x + 2kx + 11 = 0$

$\Rightarrow x^2 + x(2k-2) + 12 = 0$

has no real roots if the discriminant < 0

$\Rightarrow (2k-2)^2 - 4(12) < 0$

Since k is an integer, k – 1 is also an integer therefore, $k - 1 = 3 \Rightarrow k = 4$

We need to find the least possible value of $\dfrac{k}{4y} + 9y = \dfrac{1}{y} + 9y$.

Using AM-GM inequality we get

$\dfrac{9y + \dfrac{1}{y}}{2} \geq \sqrt{9y \times \dfrac{1}{y}}$

$\Rightarrow 9y + \dfrac{1}{y} \geq 2\sqrt{9}$

$\Rightarrow 9y + \dfrac{1}{y} \geq 6$

Hence, the least possible value is 6.

7. The number of positive integers less than 50, having exactly two distinct factors other than 1 and itself, is

7. 15

Sol.: For a number to have exactly two distinct factors other than 1 and itself the number should be of the form : a × b, x^3 where

a, b ≠ 1 are prime numbers.

Possible values of a × b less than 50 can be :

2 × 3, 2 × 5, 2 × 7, 2 × 11, 2 × 13, 2 × 17, 2 × 19, 2 × 23

3 × 5, 3 × 7, 3 × 11, 3 × 13

5 × 7

Possible values of x^3 less than 50 can be: 2^3, 3^3.

Hence, total 15 positive integers less than 50 are possible.

8. Ravi is driving at a speed of 40 km/h on a road. Vijay is 54 meters behind Ravi and driving in the same direction as Ravi. Ashok is driving along the same road from the opposite direction at a speed of 50 km/h and is 225 meters away from Ravi. The speed, in km/h, at which Vijay should drive so that all the three cross each other at the same time, is

1. 58.8

2. 61.6

3. 67.2

4. 64.4

8. 2

Sol.:
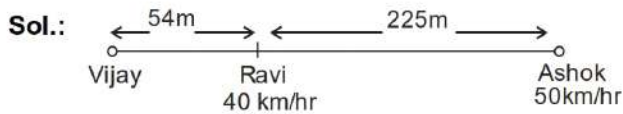
Speed of Ravi $= 40 \times \dfrac{10}{36} = \dfrac{100}{9}$ m/sec

Speed of Ashok $= = 50 \times \dfrac{10}{36} = \dfrac{125}{9}$ m/sec

Time taken by Ravi and Ashok to meet is

$= \dfrac{225}{\dfrac{100}{9} + \dfrac{125}{9}}$ = 9 sec.

In 9 seconds, Ravi travels 100m. For all the three to cross, Vijay must travel 154m in 9 seconds. Hence, the required speed in km/h

$= \dfrac{154}{9} \times \dfrac{3600}{1000}$ = 61.6 km/hr.

9. Pipes A and C are fill pipes while Pipe B is a drain pipe of a tank. Pipe B empties the full tank in one hour less than the time taken by Pipe A to fill the empty tank. When pipes A, B and C are turned on together, the empty tank is filled in two hours. If pipes B and C are turned on together when the tank is empty and Pipe B is turned off after one hour, then Pipe C takes another one hour and 15 minutes to fill the remaining tank. If Pipe A can fill the empty tank in less than five hours, then the time taken, in minutes, by Pipe C to fill the empty tank is

1. 90   2. 75

3. 120   4. 60

9. 1

Sol.: Let the time taken A to fill the tank alone be x hours, which implies the time taken by B to empty the tank alone is (x – 1) hours and the time taken by C to fill the tank is y hours.

Pips A, B and C when turned on together takes 2 hours to fill the tank.

So, $\dfrac{1}{x} - \dfrac{1}{x-1} + \dfrac{1}{y} = \dfrac{1}{2}$ ...(i)

Next, if pipes B and C are turned on together when the tank is empty and pipe B is turned off after one hour, then pipe C takes another 1 hour 15 minutes to fill the remaining tank.

This gives, $\dfrac{9}{4y} - \dfrac{1}{x-1} = 1$ ...(ii)

Solve equations (i) & (ii) to get y = $\dfrac{3}{2}$ and x = 3.

Hence, the time taken by C is $\dfrac{3}{2}$ hours, which is equal to 90 minutes.

10. Minu purchases a pair of sunglasses at Rs.1000 and sells to Kanu at 20% profit. Then, Kanu sells it back to Minu at 20% loss. Finally, Minu sells the same pair of sunglasses to Tanu. If the total profit made by Minu from all her transactions is Rs.500, then the percentage of profit made by Minu when she sold the pair of sunglasses to Tanu is

1. 35.42%   2. 26%

3. 31.25%   4. 52%

10. 3

Sol.: Initial cost price of the sunglasses for Minu = Rs. 1000.

Selling price = 1000 × 1.2 = Rs. 1200

Minu buy back the sunglasses for Rs. 960.

Since his total profit in ontime transaction, is Rs. 500, his profit while selling it to Tanu

= (500 – 200) = Rs. 300.

Hence, the profit made by Minu in the second transaction = $\dfrac{300}{960} \times 100 = 31.25\%$

11. The price of a precious stone is directly proportional to the square of its weight. Sita has a precious stone weighing 18 units. If she breaks it into four pieces with each piece having distinct integer weight, then the difference between the highest and lowest possible values of the total price of the four pieces will be 288000. Then, the price of the original precious stone is

1. 1620000
2. 972000
3. 1944000
4. 1296000

11. 4

Sol.: Let the price and weight of the precious stone be denoted by P & W respectively.

Then, $P = KW^2$ ($\because P \propto W^2$)

We need to find the values of P such that $P = K\ 18^2$.

Suppose the weights of four smaller pieces of stone be (a, b, c, d) where each of a, b, c and d are distinct integer weights.

To minimise the total price, values of (a, b, c, d) should be as close as possible such that a + b + c + d = 18.

So, (a, b, c, d) = (3, 4, 5, 6)

So, minimum cost = $K(3^2 + 4^2 + 5^2 + 6^2) = 6K$.

To maximise the total cost, values of (a, b, c, d) should be as far as possible, so, consider (1, 2, 3, 12).

So, maximum cost = $K(1^2 + 2^2 + 3^2 + 12^2)$

= K(158)

Now, 158K – 86K = 288000

$\Rightarrow$ 72K = 288000

$\Rightarrow$ K = 4000

Hence, price of original stone = 4000×18^2 = Rs. 12,96,000.

12. In a company, 20% of the employees work in the manufacturing department. If the total salary obtained by all the manufacturing employees is one-sixth of the total salary obtained by all the employees in the company, then the ratio of the average salary obtained by the manufacturing employees to the average salary obtained by the non-manufacturing employees is

1. 6 : 5
2. 4 : 5
3. 5 : 4
4. 5 : 6

12. 2

Sol.: Let there be X employees in a company, then there will be 0.2X employees in the manufacturing department. Let the total salary of all employees in the company be Y. Then total salary of manufacturing employees will be

$\dfrac{Y}{6}$, and of other employees will be $\dfrac{5Y}{6}$.

Hence, the required ratio $= \dfrac{\left(\dfrac{Y/6}{0.2X}\right)}{\left(\dfrac{5Y/6}{0.8X}\right)} = \dfrac{4}{5}$.

13. Anil borrows Rs. 2 lakhs at an interest rate of 8% per annum, compounded half-yearly. He repays Rs. 10320 at the end of the first year and closes the loan by paying the outstanding amount at the end of the third year. Then, the total interest, in rupees, paid over the three years is nearest to

1. 40991
2. 33130
3. 45311
4. 51311

13. 4

Sol.: The total amount at the end of the first

$$year = 2,00,000 \times \left[1 + \frac{8}{200}\right]^2$$

= 2,00,000 × 1.04 × 1.04

= Rs. 2,16,320

He repays Rs. 10,320. at the end of the first year, which implies the amount that remains unpaid at the end of first year is Rs. 2,06,000.

The final amount by the end of three years

= 206000 × 1.04⁴ = Rs. 2,40,990.86

Therefore, CI = 240990.86 – 206000 = Rs. 34,990.86.

Hence, total interest accured

= 34990.86 + 16320 ≈ Rs. 51,311.

14. If a certain amount of money is divided equally among n persons, each one receives Rs. 352. However, if two persons receive Rs. 506 each and the remaining amount is divided equally among the other persons, each of them receive less than or equal to Rs. 330. Then, the maximum possible value of n is

14. 16

Sol.: Total amount of money = 352n.

If two persons receive Rs 506, then remaining persons will receive 352n – 1012.

If this amount is divided equally to n – 2 persons each of them receive less than or equal to Rs. 330

$$\Rightarrow \frac{352n - 1012}{n - 2} \le 330$$

⇒ 352n – 1012 ≤ 330n – 660

⇒ 22n ≤ 352

$$\Rightarrow n \le \frac{352}{22}$$

⇒ n ≤ 16

Hence, maximum possible value of n is 16.

15. Jayant bought a certain number of white shirts at the rate of Rs. 1000 per piece and a certain number of blue shirts at the rate of Rs. 1125 per piece. For each shirt, he then set a fixed market price which was 25% higher than the average cost of all the shirts. He sold all the shirts at a discount of 10% and made a total profit of Rs. 51000. If he bought both colors of shirts, then the maximum possible total number of shirts that he could have bought is

15. 407

Sol.: Let number of white and blue shirts bought by Jayant be 'w' and 'b' respectively.
Then,

$\Rightarrow$ (1000w + 1125b) (1.25) (0.9) – (100w + 1125b) = 51000

$\Rightarrow$ 1125w + 1265.625b – 1000a – 1125b = 51000

$\Rightarrow$ 8w + 9b = 3264

$\Rightarrow$ w = $\dfrac{3264 - 9b}{8}$ = 408 – $\dfrac{9b}{8}$

For b = 8, w = 399.

Hence, maximum total number of shirts bought = 407.

16. A container has 40 liters of milk. Then, 4 liters are removed from the container and replaced with 4 liters of water. This process of replacing 4 liters of the liquid in the container with an equal volume of water is continued repeatedly. The smallest number of times of doing this process, after which the volume of milk in the container becomes less than that of water, is

16. 7

Sol.: Let after 'n' operation, quality of milk is

$= 40\left(1 - \dfrac{4}{40}\right)^n$

$\Rightarrow$ $40(0.9)^n < 20$

$\Rightarrow$ $(0.9)^n < 0.5$

$\Rightarrow$ $n \log 0.9 > \log 0.5$

$\Rightarrow$ $n > \dfrac{\log 0.5}{\log 0.9} \approx 6.578$

Hence, the smallest number of times of doing this process is n = 7.

17. A triangle is drawn with its vertices on the circle C such that one of its sides is a diameter of C and the other two sides have their lengths in the ratio a : b. If the radius of the circle is r, then the area of the triangle is
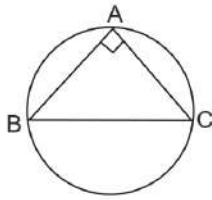
1. $\dfrac{2abr^2}{a^2 + b^2}$

2. $\dfrac{abr^2}{a^2 + b^2}$

3. $\dfrac{abr^2}{2(a^2 + b^2)}$

4. $\dfrac{4abr^2}{a^2 + b^2}$

Sol.:

Here BC is the diameter and $\angle ABC = 90°$

Area of the triangle $= \dfrac{1}{2} \times (ax) \times (bx) = \dfrac{ab}{2}x^2$

Diameter $(BC) = \sqrt{(ax)^2 + (bx)^2} = 2r$

$\Rightarrow$ $(ax)^2 + (bx)^2 = 4r^2$

$\Rightarrow$ $x^2\,[a^2 + b^2] = 4r^2$

$\Rightarrow$ $x^2 = \dfrac{4r^2}{a^2 + b^2}$

Hence, the area $= \dfrac{abx^2}{2} = \dfrac{ab}{2} \times \dfrac{4r^2}{a^2 + b^2} = \dfrac{2abr^2}{a^2 + b^2}$.

18. In a rectangle ABCD, AB = 9 cm and BC = 6 cm. P and Q are two points on BC such that the areas of the figures ABP, APQ, and AQCD are in geometric progression. If the area of the figure AQCD is four times the area of triangle ABP, then BP : PQ : QC is
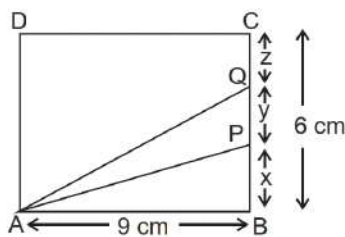
1. 1 : 2 : 1
2. 2 : 4 : 1
3. 1 : 1 : 2
4. 1 : 2 : 4

18. 2

Sol.:

Let the area of ABP, APQ and AQCD = a, ar, ar^2

But since $ar^2 = 4a$, therefore, $r = 2$.

Area of ABP $= \dfrac{9x}{2}$, area of APQ $= \dfrac{9y}{2}$

So, area of AQCD $= 9 \times 6 - \dfrac{9}{2}(x + y) = 54 - \dfrac{9}{2}(x + y)$

(I) $\dfrac{\dfrac{9y}{2}}{\dfrac{9x}{2}} = 2 \Rightarrow y = 2x$

(II) $54 - \dfrac{9}{2}(3x) = 4\left(\dfrac{9x}{2}\right)$
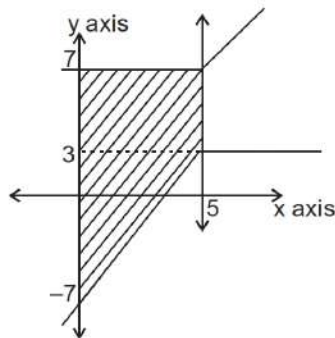
$\Rightarrow 54 = (7x) \times \dfrac{9}{2}$

$x = \dfrac{12}{7}$, $y = \dfrac{24}{7}$, and $z = \dfrac{6}{7}$

Hence, required ratio is $2 : 4 : 1$.

19. The area of the quadrilateral bounded by the Y-axis, the line $x = 5$, and the lines $|x - y| - |x - 5| = 2$, is

19. 45

Sol.:

Hence, the required area of the shaded region

$= 5 \times 4 + \dfrac{1}{2} \times 10 \times 5 = 45$ sq. unit.

20. If $p^2 + q^2 - 29 = 2pq - 20 = 52 - 2pq$, then the difference between the maximum and minimum possible value of $(p^3 - q^3)$ is

1. 189
2. 243
3. 486
4. 378

20. 4

Sol.: Given: $p^2 + q^2 - 29 = 2pq - 20 = 52 - 2pq$

(I) $p^2 + q^2 - 29 = 2pq - 20$

$\Rightarrow (p - q)^2 = 9$

$\Rightarrow p - q = \pm 3$

(II) $P^2 + q^2 - 29 = 52 - 2pq$

$\Rightarrow (p + q)^2 = 81$

(III) $2pq - 20 = 52 - 2pq$

$\Rightarrow 4pq = 72$

$\Rightarrow pq = 18$

Now, $(p - q)^3 = p^3 - q^3 + 3pq^2 - 3p^2q$.

$\Rightarrow p^3 - q^3 = (p - q)^3 + 3pq(p - q)$

$= (p - q)[(p - q)^2 + 3pq]$

$= (p - q)[(p + q)^2 - pq]$

$= 63(p - q)$

So, max $(p^3 - q^3) = 3 \times 63 = 189$ and,

min $(p^3 - q^3) = (-3) \times 63 = -189$

Hence, required difference $= 189 - (-189) = 378$.

21. Let both the series $a_1, a_2, a_3, \ldots$ and $b_1, b_2, b_3 \ldots$ be in arithmetic progression such that the common differences of both the series are prime numbers. If $a_5 = b_9$, $a_{19} = b_{19}$ and $b_2 = 0$, then a_{11} equals

1. 83
2. 79
3. 84
4. 86

21. 2

Sol.: Let the series be:

$a_1 = a$, $a_2 = a + d_1$, $a_3 = a + 2d_1$ and so on

Similarly, let

$b_1 = b$, $b_2 = b + d_2$, $b_3 = b + 2d_2$ and so on.

Since

$a_5 = b_9 \Rightarrow a + 4d_1 = b + 8d_2$ \qquad ...(1)

$a_{19} = b_{19} \Rightarrow a + 18d_1 = b + 18d_2$

$\Rightarrow (a - b) + 18(d_1 - d_2) = 0$ \qquad ...(2)

$b_2 = 0 \Rightarrow b + d_2 = 0$

$\Rightarrow b = -d_2$ \qquad ...(3)

Substitute the value of 'b' from equation (3) in equation (1) and (2) and solve further to get, $7d_1 = 5d_2$.

Since d_1 and d_2 are prime numbers, therefore $d_1 = 5$ and $d_2 = 7$

Hence, $a_{11} = a + 10d_1 = 29 + 10(5) = 79$.

22. Let a_n and b_n be two sequences such that $a_n = 13 + 6(n - 1)$ and $b_n = 15 + 7(n - 1)$ for all natural numbers n. Then, the largest three digit integer that is common to both these sequences, is

22. 967

Sol.: $\{a_n\} = \{13, 19, 25, 31, 37, 43, 49, \ldots\}$

$\{b_n\} = \{15, 22, 29, 36, 43, 50, \ldots\}$

First common term = 43

Any next common term can be found out by using $= 43 + \text{LCM}(6, 7)K$

$= 43 + 42K$

where K is a positive integer.

For K = 22, $43 + 42K = \boxed{967}$

Hence, the largest three digit number common to both these sequence is 967.