VERBAL ABILITY AND READING COMPREHENSION

The passage below is accompanied by a set of questions. Choose the best answer to each question.
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[Octopuses are] misfits in their own extended families . . . They belong to the Mollusca class Cephalopoda. But they don't look like their cousins at all. Other molluscs include sea snails, sea slugs, bivalves - most are shelled invertebrates with a dorsal foot. Cephalopods are all arms, and can be as tiny as 1 centimetre and as large at 30 feet. Some of them have brains the size of a walnut, which is large for an invertebrate. . . .

It makes sense for these molluscs to have added protection in the form of a higher cognition; they don't have a shell covering them, and pretty much everything feeds on cephalopods, including humans. But how did cephalopods manage to secure their own invisibility cloak? Cephalopods fire from multiple cylinders to achieve this in varying degrees from species to species. There are four main catalysts - chromatophores, iridophores, papillae and leucophores. . . .

[Chromatophores] are organs on their bodies that contain pigment sacs, which have red, yellow and brown pigment granules. These sacs have a network of radial muscles, meaning muscles arranged in a circle radiating outwards. These are connected to the brain by a nerve. When the cephalopod wants to change colour, the brain carries an electrical impulse through the nerve to the muscles that expand outwards, pulling open the sacs to display the colours on the skin. Why these three colours? Because these are the colours the light reflects at the depths they live in (the rest is absorbed before it reaches those depths). . . .

Well, what about other colours? Cue the iridophores. Think of a second level of skin that has thin stacks of cells. These can reflect light back at different wavelengths It's using the same properties that we've seen in hologram stickers, or rainbows on puddles of oil. You move your head and you see a different colour. The sticker isn't doing anything but reflecting light - it's your movement that's changing the appearance of the colour. This property of holograms, oil and other such surfaces is called "iridescence". . . .

Papillae are sections of the skin that can be deformed to make a texture bumpy. Even humans possess them (goosebumps) but cannot use them in the manner that cephalopods can. For instance, the use of these cells is how an octopus can wrap itself over a rock and appear jagged or how a squid or cuttlefish can imitate the look of a coral reef by growing miniature towers on its skin. It actually matches the texture of the substrate it chooses.

Finally, the leucophores: According to a paper, published in Nature, cuttlefish and octopuses possess an additional type of reflector cell called a leucophore. They are cells that scatter full spectrum light so that they appear white in a similar way that a polar bear's fur appears white. Leucophores will also reflect any filtered light shown on them . . . If the water appears blue at a certain depth, the octopuses and cuttlefish can appear blue; if the water appears green, they appear green, and so on and so forth.

1. Based on the passage, we can infer that all of the following statements, if true, would weaken the camouflaging adeptness of Cephalopods EXCE
(a) the number of chromatophores in Cephalopods is half the number of iridophores and leucophores.
(b) the temperature of water at the depths at which Cephalopods reside renders the transmission of neural signals difficult.
(c) the hydrostatic pressure at the depths at which Cephalopods reside renders radial muscle movements difficult.
(d) light reflects the colours red, green, and yellow at the depths at which Cephalopods reside.

2. All of the following are reasons for octopuses being "misfits" EXCEPT that they:
(a) exhibit higher intelligence than other molluscs.
(b) are consumed by humans and other animals.
(c) do not possess an outer protective shell.
(d) have several arms.

3. Which one of the following statements is not true about the camouflaging ability of Cephalopods?
(a) Cephalopods can change their texture.
(b) Cephalopods can change their colour.
(c) Cephalopods can take on the colour of their predator.
(d) Cephalopods can blend into the colour of their surroundings.

4. Based on the passage, it can be inferred that camouflaging techniques in an octopus are most dissimilar to those in:
(a) polar bears (b) cuttlefish
(c) sea snails (d) squids

The passage below is accompanied by a set of questions. Choose the best answer to each question.

When we teach engineering problems now, we ask students to come to a single "best" solution defined by technical ideals like low cost, speed to build, and ability to scale. This way of teaching primes students to believe that their decision-making is purely objective, as it is grounded in math and science. This is known as technical-social dualism, the idea that the technical and social dimensions of engineering problems are readily separable and remain distinct throughout the problem-definition and solution process.

Nontechnical parameters such as access to a technology, cultural relevancy or potential harms are deemed political and invalid in this way of learning. But those technical ideals are at their core social and political choices determined by a dominant culture focused on economic growth for the most privileged segments of society. By choosing to downplay public welfare as a critical parameter for engineering design, we risk creating a culture of disengagement from societal concerns amongst engineers that is antithetical to the ethical code of engineering.

In my field of medical devices, ignoring social dimensions has real consequences Most FDA-approved drugs are incorrectly dosed for people assigned female at birth, leading to unexpected adverse reactions. This is because they have been inadequately represented in clinical trials.

Beyond physical failings, subjective beliefs treated as facts by those in decision-making roles can encode social inequities. For example, spirometers, routinely used devices that measure lung capacity, still have correction factors that automatically assume smaller lung capacity in Black and Asian individuals. These racially based adjustments are derived from research done by eugenicists who thought these racial differences were biologically determined and who considered nonwhite people as inferior. These machines ignore the influence of social and environmental factors on lung capacity.

Many technologies for systemically marginalized people have not been built because they were not deemed important such as better early diagnostics and treatment for diseases like endometriosis, a disease that afflicts 10 percent of people with uteruses. And we hardly question whether devices are built sustainably, which has led to a crisis of medical waste and health care accounting for 10 percent of U.S. greenhouse gas emissions.

Social justice must be made core to the way engineers are trained. Some universities are working on this. . . . Engineers taught this way will be prepared to think critically about what problems we choose to solve, how we do so responsibly and how we build teams that challenge our ways of thinking.

Individual engineering professors are also working to embed societal needs in their pedagogy. Darshan Karwat at the University of Arizona developed activist engineering to challenge engineers to acknowledge their full moral and social responsibility through practical self-reflection. Khalid Kadir at the University of California, Berkeley, created the popular course Engineering, Environment, and Society that teaches engineers how to engage in place-based knowledge, an understanding of the people, context and history, to design better technical approaches in collaboration with communities. When we design and build with equity and justice in mind, we craft better solutions that respond to the complexities of entrenched systemic problems.

5. In this passage, the author is making the claim that:

(a) the objective of best solutions in engineering has shifted the focus of pedagogy from humanism and social obligations to technological perfection.

(b) engineering students today are taught to focus on objective technical outcomes, independent of the social dimensions of their work.

(c) engineering students today are trained to be non-subjective in their reasoning as this best enables them to develop much-needed universal solutions.

(d) technical-social dualism has emerged as a technique for engineering students to incorporate social considerations into their technical problem-solving processes.

6. All of the following are examples of the negative outcomes of focusing on technical ideals in the medical sphere EXCEPT the:

(a) exclusion of non-privileged groups in clinical trials which leads to incorrect drug dosages.

(b) neglect of research and development of medical technologies for the diagnosis and treatment of diseases that typically afflict marginalised communities.

(c) incorrect assignment of people as female at birth which has resulted in faulty drug interventions.

(d) continuing calibration of medical devices based on past racial biases that have remained unadjusted for changes.

7. The author gives all of the following reasons for why marginalized people are systematically discriminated against in technology-re interventions EXCEPT:

(a) “And we hardly question whether devices are built sustainably, which has led to a crisis of medical waste and health careaccounting for 10 percent of U.S. greenhouse gas emissions.”

(b) "But those technical ideals are at their core social and political choices determined by a dominant culture focused on economic growth for the most privileged segments of society."
(c) "These racially based adjustments are derived from research done by eugenicists who thought these racial differences were biologically determined and who considered nonwhite people as inferior."
(d) "Beyond physical failings, subjective beliefs treated as facts by those in decision-making roles can encode social inequities."

8. We can infer that the author would approve of a more evolved engineering pedagogy that includes all of the following EXCEPT:

(a) making considerations of environmental sustainability intrinsic to the development of technological solutions.
(b) design that is based on the needs of communities using local knowledge and responding to local priorities.
(c) a more responsible approach to technical design and problem-solving than a focus on speed in developing and bringing to scale.
(d) moving towards technical-social dualism where social community needs are incorporated in problem-definition and solutions.

The passage below is accompanied by a set of questions. Choose the best answer to each question.

Humans today make music. Think beyond all the qualifications that might trail after this bald statement: that only certain humans make music, that extensive training is involved, that many societies distinguish musical specialists from nonmusicians, that in today's societies most listen to music rather than making it, and so forth. These qualifications, whatever their local merit, are moot in the face of the overarching truth that making music, considered from a cognitive and psychological vantage, is the province of all those who perceive and experience what is made. We are, almost all of us, musicians everyone who can entrain (not necessarily dance) to a beat, who can recognize a repeated tune (not necessarily sing it), who can distinguish one instrument or one singing voice from another. I will often use an antique word, recently revived, to name this broader musical experience. Humans are musicking creatures....

The set of capacities that enables musicking is a principal marker of modern humanity. There is nothing polemical in this assertion except a certain insistence, which will figure often in what follows, that musicking be included in our thinking about fundamental human commonalities. Capacities involved in musicking are many and take shape in complicated ways, arising from innate dispositions . . . Most of these capacities overlap with nonmusical ones, though a few may be distinct and dedicated to musical perception and production. In the area of overlap, linguistic capacities seem to be particularly important, and humans are (in principle) language-makers in addition to music-makers - speaking creatures as well as musicking ones.

Humans are symbol-makers too, a feature tightly bound up with language, not so tightly with music. The species Cassirer dubbed Homo symbolicus cannot help but tangle musicking in webs of symbolic thought and expression, habitually making it a component of behavioral complexes that form such expression. But in fundamental features musicking is neither language-like nor symbol-like, and from these differences come many clues to its ancient emergence.

If musicking is a primary, shared trait of modern humans, then to describe its emergence must be to detail the coalescing of that modernity. This took place, archaeologists are clear, over a very long durée: at least 50,000 years or so, more likely something closer to 200,000, depending in part on what that coalescence is taken to comprise. If we look back 20,000 years, a small portion of this long period, we reach the lives of humans whose musical capacities were probably little different from our own. As we look farther back we reach horizons where this similarity can no longer hold - perhaps 40,000 years ago, perhaps 70,000, perhaps 100,000. But we never cross a line before which all the cognitive capacities recruited in modern musicking abruptly disappear. Unless we embrace the incredible notion that music sprang forth in full-blown glory, its emergence will have to be tracked in gradualist terms across a long period.

This is one general feature of a history of music's emergence . . . The history was at once sociocultural and biological . . . The capacities recruited in musicking are many, so describing its emergence involves following several or many separate strands.

9. Based on the passage, which one of the following statements is a valid argument about the emergence of music/musicking?

(a) Anyone who can perceive and experience music must be considered capable of musicking.
(b) 20,000 years ago, human musical capacities were not very different from what they are today.

(c) All musical work is located in the overlap between linguistic capacity and music production.
(d) Although musicking is not language-like, it shares the quality of being a form of expression.

10. Which one of the following statements, if true, would weaken the author's claim that humans are musicking creatures?
(a) Nonmusical capacities are of far greater consequence to human survival than the capacity for music.
(b) From a cognitive and psychological vantage, musicking arises from unconscious dispositions, not conscious ones.
(c) Musical capacities are primarily socio-cultural, which explains the wide diversity of musical forms.
(d) As musicking is neither language-like nor symbol-like, it is a much older form of expression.

11. Which one of the following sets of terms best serves as keywords to the passage?
(a) Musicking; Cognitive psychology; Antique; Symbol-makers; Modernity.
(b) Humans; Capacities; Language; Symbols; Modernity.
(c) Humans; Musicking; Linguistic capacities; Symbol-making; Modern humanity.
(d) Humans; Psychological vantage; Musicking; Cassirer; Emergence of music.

12. Think beyond all the qualifications that might trail after this bald statement . . ." In the context of the passage, what is the author trying to communicate in this quoted extract?
(a) A bald statement is one that requires no qualifications to infer its meaning.
(b) Although there may be many caveats and other considerations, the statement is essentially true.
(c) Thinking beyond qualifications allows us to give free reign to musical expressions.
(d) A bald statement is one that is trailed by a series of qualifying clarifications and caveats.

The passage below is accompanied by a set of questions. Choose the best answer to each question.

We begin with the emergence of the philosophy of the social sciences as an arena of thought and as a set of social institutions. The two characterisations overlap but are not congruent. Academic disciplines are social institutions. . . . My view is that institutions are all those social entities that organise action: they link acting individuals into social structures. There are various kinds of institutions. Hegelians and Marxists emphasise universal institutions such as the family, rituals, governance, economy and the military. These are mostly institutions that just grew. Perhaps in some imaginary beginning of time they spontaneously appeared. In their present incarnations, however, they are very much the product of conscious attempts to mould and plan them. We have family law, established and disestablished churches, constitutions and laws, including those governing the economy and the military. Institutions deriving from statute, like joint-stock companies are formal by contrast with informal ones such as friendships. There are some institutions that come in both informal and formal variants, as well as in mixed ones. Consider the fact that the stock exchange and the black market are both market institutions, one formal one not. Consider further that there are many features of the work of the stock exchange that rely on informal, noncodifiable agreements, not least the language used for communication. To be precise, mixtures are the norm . . . From constitutions at the top to by-laws near the bottom we are always adding to, or tinkering with, earlier institutions, the grown and the designed are intertwined.

It is usual in social thought to treat culture and tradition as different from, although alongside, institutions. The view taken here is different. Culture and tradition are sub-sets of institutions analytically isolated for explanatory or expository purposes. Some social scientists have taken all institutions, even purely local ones, to be entities that satisfy basic human needs - under local conditions . . . Others differed and declared any structure of reciprocal roles and norms an institution. Most of these differences are differences of emphasis rather than disagreements. Let us straddle all these versions and present institutions very generally . . . as structures that serve to coordinate the actions of individuals Institutions themselves then have no aims or purpose other than those given to them by actors or used by actors to explain them . . .

Language is the formative institution for social life and for science Both formal and informal language is involved, naturally grown or designed. (Language is all of these to varying degrees.) Languages are paradigms of institutions or, from another perspective, nested sets of institutions. Syntax, semantics, lexicon and alphabet/character-set are all institutions within the larger institutional framework of a written language. Natural languages are typical examples of what Ferguson called 'the result of human action, but not the execution of any human design'[;] reformed natural languages and artificial languages introduce design into their modifications or refinements of natural language. Above all, languages are paradigms of institutional tools that function to coordinate.

13. Which of the following statements best represents the essence of the passage?
(a) Language is the fundamental formal institution for social life and for science.
(b) It is usual in social thought to treat culture and tradition as different from institutions.
(c) Institutions are structures that serve to coordinate the actions of individuals.
(d) The stock exchange and the black market are both market institutions.

14. "Consider the fact that the stock exchange and the black market are both market institutions, one formal one not." Which one of the foll statements best explains this quote, in the context of the passage?
(a) The stock exchange and the black market are examples of how, even within the same domain, different kinds of institutions can co-exist.
(b) Market instruments can be formally traded in the stock exchange and informally traded in the black market.
(c) The stock exchange and the black market are both organised to function by rules.
(d) The stock exchange and the black market are both dependent on the market to survive.

15. In the first paragraph of the passage, what are the two "characterisations" that are seen as overlapping but not congruent?
(a) "the philosophy of the social sciences" and "a set of social institutions".
(b) "an arena of thought" and "academic disciplines".
(c) "academic disciplines" and "institutions".
(d) "individuals" and "social structures".

16. All of the following inferences from the passage are false, EXCEPT:
(a) "natural language" refers to that stage of language development where no conscious human intent is evident in the formation of language.
(b) the institution of friendship cannot be found in the institution of joint-stock companies because the first is an informal institution, while the second is a formal one.
(c) institutions like the family, rituals, governance, economy, and the military are natural and cannot be consciously modified.
(d) as concepts, "culture" and "tradition" have no analytical, explanatory or expository power, especially when they are treated inisolation.

17. The four sentences (labelled 1, 2, 3 and 4) 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. From chemical pollutants in the environment to the damming of rivers to invasive species transported through global trade and travel, every environmental issue is different and there is no single tech solution that can solve this crisis.
2. Discourse on the threat of environmental collapse revolves around cutting down emissions, but biodiversity loss and ecosystem collapse are caused by myriad and diverse reasons.
3. This would require legislation that recognises the rights of future generations and other species that allows the judiciary to uphold a much higher standard of environmental protection than currently possible.
4. Clearly, our environmental crisis requires large political solutions, not minor technological ones, so, instead of focusing on infinite growth, we could consider a path of stable-state economies, while preserving markets and healthy competition.

18. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide in which blank (option 1, 2, 3, or 4) the follow sentence would best fit.
Sentence: Most were first-time users of a tablet and a digital app.
Paragraph: Aage Badhein's USP lies in the ethnographic research that constituted the foundation of its development process. Customizations based on learning directly from potential users were critical to making this self-paced app suitable for both a literate and non-literate audience. __(1)___ The user interface caters to a Hindi-speaking audience who have minimal to no experience with digital services and devices. __(2) The content and functionality of the app are suitable for a wide audience. This includes youth preparing for an independent role in life or a student ready to create a strong foundation of financial management early in her life. __(3)__ Household members desirous of improving their family's financial strength to reach their aspirations can also benefit. We piloted Aage Badhein in early 2021 with over 400 women from rural areas.
(1) 1 (2) 2
(3) 3 (4) 4

19. The passage given below is followed by four alternate summaries. Choose the option that best captures the essence of the passage.
Several of the world's earliest cities were organised along egalitarian lines. In some regions, urban populations governed themselves for centuries without any indication of the temples and palaces that

would later emerge; in others, temples and palaces never emerged at all, and there is simply no evidence of a class of administrators or any other sort of ruling stratum. It would seem that the mere fact of urban life does not, necessarily, imply any particular form of political organization, and never did. Far from resigning us to inequality, the picture that is now emerging of humanity's past may open our eyes to egalitarian possibilities we otherwise would have never considered.

(a) The lack of hierarchical administration in ancient cities can be deduced by the absence of religious and regal structures such as temples and palaces.
(b) Contrary to our assumption that urban settlements have always involved hierarchical political and administrative structures, ancient cities were not organised in this way.
(c) The emergence of a class of administrators and ruling stratum transformed the egalitarian urban life of ancient cities to the hierarchical civic organisations of today.
(d) We now have the evidence in support of the existence of an egalitarian urban life in some ancient cities, where political and civic organisation was far less hierarchical.

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

There's a common idea that museum artworks are somehow timeless objects available to admire for generations to come. But many are objects of decay. Even the most venerable Old Master paintings don't escape: pigments discolour, varnishes crack, canvases warp. This challenging fact of art-world life is down to something that sounds more like a thread from a morality tale: inherent vice. Damien Hirst's iconic shark floating in a tank - entitled The Physical Impossibility of Death in the Mind of Someone Living - is a work that put a spotlight on inherent vice. When he made it in 1991, Hirst got himself in a pickle by not using the right kind of pickle to preserve the giant fish. The result was that the shark began to decompose quite quickly - its preserving liquid clouding, the skin wrinkling, and an unpleasant smell wafting from the tank.

(a) Museums have to guard timeless art treasures from intrinsic defects such as the deterioration of paint, polish and canvas.
(b) The role of museums has evolved to ensure that the artworks are preserved forever in addition to guarding and displaying them.
(c) Artworks may not last forever; they may deteriorate with time, and the challenge is to slow down their degeneration.
(d) Museums are left with the moral responsibility of restoring and preserving the artworks since artists cannot preserve their works beyond their life.

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

Today, many of the debates about behavioural control in the age of big data echo Cold War-era anxieties about brainwashing, insidious manipulation and repression in the 'technological society'. In his book Psychopolitics, Han warns of the sophisticated use of targeted online content, enabling 'influence to take place on a pre-reflexive level'. On our current trajectory, "freedom will prove to have been merely an interlude." The fear is that the digital age has not liberated us but exposed us, by offering up our private lives to machine-learning algorithms that can process masses of personal and behavioural data. In a world of influencers and digital entrepreneurs, it's not easy to imagine the resurgence of a culture engendered through disconnect and disaffiliation, but concerns over the threat of online targeting, polarisation and big data have inspired recent polemics about the need to rediscover solitude and disconnect.

(a) The notion of freedom and privacy is at stake in a world where artificial intelligence is capable of influencing behaviour through data gathered online.
(b) The role of technology in influencing public behaviour is reminiscent of the manner in which behaviour was manipulated during the Cold War.
(c) With big data making personal information freely available, the debate on the nature of freedom and the need for privacy has resurfaced.
(d) Rather than freeing us, digital technology is enslaving us by collecting personal information and influencing our online behaviour.

22. There is a sentence that is missing in the paragraph below. Look at the paragraph and decide in which blank (option 1, 2, 3, or 4) the foll sentence would best fit.

Sentence: This was years in the making but fast-tracked during the pandemic, when "people started being more mindful about their foo explained.

Paragraph: For millennia, ghee has been a venerated staple of the subcontinental diet, but it fell out of favour a few decades ago when saturated fats were largely considered to be unhealthy. __(1)__But more recently, as the thinking around saturated fats is shifting globally, Indians are finding their own way back to this ingredient that is so integral to their cuisine. _(2)__For Karmakar, a renewed interest in ghee is emblematic of a return-to-basics movement in

India. __(3)___ This movement is also part of an overall trend towards "slow food". In keeping with the movement's philosophy, ghee can be produced locally (even at home) and has inextricable cultural ties. __(4)__ At a basic level, ghee is a type of clarified butter believed to have originated in India as a way to preserve butter from going rancid in the hot climate.

(1) 1 (2) 2
(3) 3 (4) 4

23. The four sentences (labelled 1, 2, 3 and 4) 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:

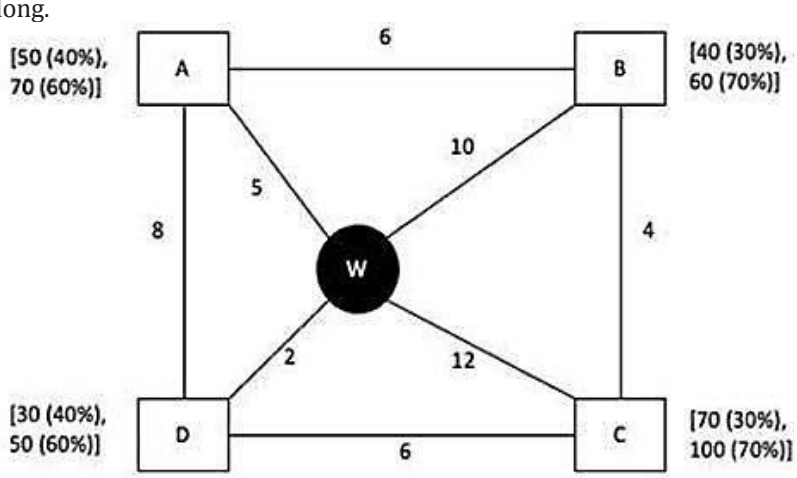
(a) Women may prioritize cooking because they feel they alone are responsible for mediating a toxic and unhealthy food system.
(b) Food is commonly framed through the lens of individual choice: you can choose to eat healthily.
(c) This is particularly so in a neoliberal context where the state has transferred the responsibility for food onto individual consumers.
(d) The individualized framing of choice appeals to a popular desire to experience agency, but draws away from the structural obstacles that stratify individual food choices.

24. The four sentences (labelled 1, 2, 3 and 4) 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. The trajectory of cheerfulness through the self is linked to the history of the word 'cheer' which comes from an Old French meaning 'face'.
2. Translations of the Bible into vernacular languages, expanded the noun 'cheer' into the more abstract 'cheerful-ness', something that circulates as an emotional and social quality defining the self and a moral community.
3. When you take on a cheerful expression, no matter what the state of your soul, your cheerfulness moves into the self: the interior of the self is changed by the power of cheer.
4. People in the medieval 'Canterbury Tales' have a 'piteous' or a 'sober' cheer; 'cheer' is an expression and a body part, lying at the intersection of emotions and physiognomy.

DATA INTERPRETATION AND LOGICAL REASONING

Directions (Q.25-Q.29): Every day a widget supplier supplies widgets from the warehouse (W) to four locations – Ahmednagar (A), Bikrampore (B), Chitrachak(C), and Deccan Park (D). The daily demand for widgets in each location is uncertain and independent of each other. Demands and corresponding probability values (in parenthesis) are given against each location (A, B, C, and D) in the figure below. For example,there is a 40% chance that the demand in Ahmednagar will be 50 units and a 60% chance that the demand will be 70 units. The linesin the figure connecting the locations and warehouse represent two-way roads connecting those places with the distances (in km)shown beside the line. The distances in both the directions along a road are equal. For example, the road from Ahmednagar to Bikrampore and the road from Bikrampore to Ahmednagar are both 6 km long.



Every day the supplier gets the information about the demand values of the four locations and creates the travel route that starts from the warehouse and ends at a location after visiting all the locations exactly once. While making the route plan, the supplier goes to the locations in decreasing order of demand. If there is a tie for the choice of the next location, the supplier will go to the location closestto the current location. Also, while creating the route, the supplier can either follow the direct path (if available) from one location to another or can take the path via the warehouse. If both paths are available (direct and via warehouse), the supplier will choose thepath with minimum distance.

25. If the last location visited is Ahmednagar, then what is the total distance covered in the route (in km)?
[**Note**: There is an ambiguity in this question and hence was discarded by IIM Bangalore.]

26. If the total number of widgets delivered in a day is 250 units, then what is the total distance covered in the route (in km)?

27. What is the chance that the total number of widgets delivered in a day is 260 units and the route ends at Bikrampore?
(a) 7.56% (b) 10.80%
(c) 17.64% (d) 33.33%

28. If the first location visited from the warehouse is Ahmednagar, then what is the chance that the total distance covered in the route is 40 km?
(a) 3.24% (b) 5.4%
(c) 18% (d) 30%

29. If Ahmednagar is not the first location to be visited in a route and the total route distance is 29 km, then which of the following is a possible number ofwidgets delivered on that day?
(a) 210 (b) 250
(c) 200 (d) 220

Directions (Q.30-Q.34): A speciality supermarket sells 320 products. Each of these products was either a cosmetic product or a nutrition product. Each of these products was also either a foreign product or a domestic product. Each of these products had at least one of the two approvals – FDAor EU.
The following facts are also known:
There were equal numbers of domestic and foreign products.
Half of the domestic products were FDA approved cosmetic products.
None of the foreign products had both the approvals, while 60 domestic products had both the approvals.

There were 140 nutrition products, half of them were foreign products.
There were 200 FDA approved products. 70 of them were foreign products and 120 of them were cosmetic products.

30. How many foreign products were FDA approved cosmetic products?

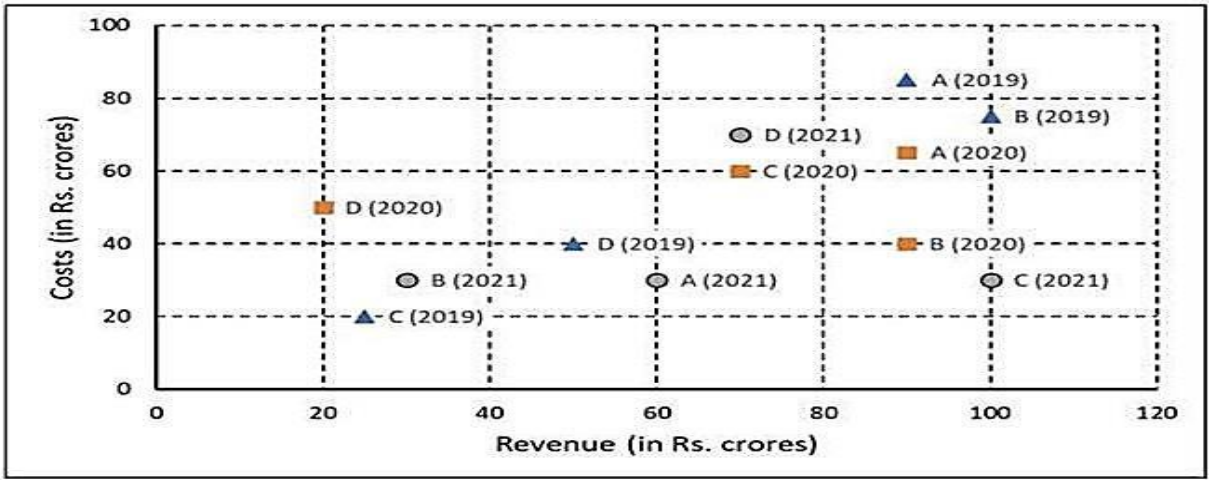
31. How many cosmetic products did not have FDA approval?
(a) 60
(b) 10
(c) 50
(d) Cannot be determined

32. Which among the following options best represents the number of domestic cosmetic products that had both the approvals?
(a) At least 20 and at most 70
(b) At least 10 and at most 60
(c) At least 20 and at most 50
(d) At least 10 and at most 80

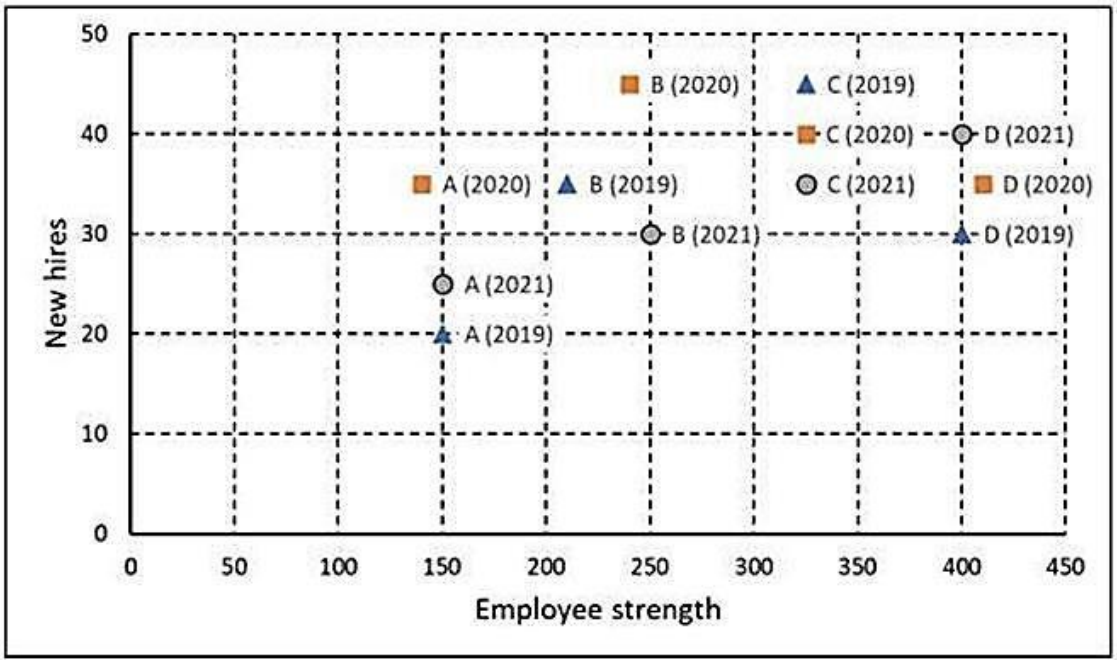
33. If 70 cosmetic products did not have EU approval, then how many nutrition products had both the approvals?
(a) 30 (b) 50
(c) 10 (d) 20

34. If 50 nutrition products did not have EU approval, then how many domestic cosmetic products did not have EU approval?

Directions (Q.35-Q.39): The two plots below show data for four companies code-named A, B, C, and D over three years - 2019, 2020, and 2021.
The first plot shows the revenues and costs incurred by the companies during these years. For example, in 2021, company C earnedRs.100 crores in revenue and spent Rs.30 crores. The profit of a company is defined as its revenue minus its costs.



The second plot shows the number of employees employed by the company (employee strength) at the start of each of these three years, as well as the number of new employees hired each year (new hires). For example, Company B had 250 employees at the startof 2021, and 30 new employees joined the company during the year.



35. Considering all three years, which company had the highest annual profit?
(a) Company D (b) Company C
(c) Company B (d) Company A

36. Which of the four companies experienced the highest annual loss in any of the years?
(a) Company C (b) Company A
(c) Company D (d) Company B

37. The ratio of a company's annual profit to its annual costs is a measure of its performance. Which of the four companies had the lowest value of thisratio in 2019?
(a) Company C (b) Company B
(c) Company D (d) Company A

38. The total number of employees lost in 2019 and 2020 was the least for:
(a) Company B (b) Company A
(c) Company D (d) Company C

39. Profit per employee is the ratio of a company's profit to its employee strength. For this purpose, the employee strength in a year is the average of the employee strength at the beginning of that year and the beginning of the next year. In 2020, which of the four companies had the highest profit per employee?
(a) Company B (b) Company C
(c) Company D (d) Company A

Directions (Q.40-Q.44): A few salesmen are employed to sell a product called TRICCEK among households in various housing complexes. On each day, a salesman is assigned to visit one housing complex. Once a salesman enters a housing complex, he can meet any number of households in the time available. However, if a household makes a complaint against the salesman, then he must leave the housing complex immediately and cannot meet any other household on that day. A household may buy any number of TRICCEK items or may not buy any item. The salesman needs to record the total number of TRICCEK items sold as well as the number of households met in each day. The success rate of a salesman for a day is defined as the ratio of the number of items sold to the number of householdsmet on that day. Some details about the performances of three salesmen - Tohri, Hokli and Lahur, on two particular days are given below.
Over the two days, all three of them met the same total number of households, and each of them sold a total of 100 items.
On both days, Lahur met the same number of households and sold the same number of items.
Hokli could not sell any item on the second day because the first household he met on that day complained against him.
Tohri met 30 more households on the second day than on the first day.
Tohri's success rate was twice that of Lahur's on the first day, and it was 75% of Lahur's on the second day.

40. What was the total number of households met by Tohri, Hokli and Lahur on the first day?

41. How many TRICCEK items were sold by Tohri on the first day?

42. How many households did Lahur meet on the second day?

(a) more than 35
(b) between 21 and 29
(c) between 30 and 35
(d) 20 or less

43. How many households did Tohri meet on the first day?

(a) between 11 and 20
(b) 10 or less
(c) more than 40
(d) between 21 and 40

44. Which of the following statements is FALSE?

(a) Tohri had a higher success rate on the first day compared to the second day.
(b) Among the three, Tohri had the highest success rate on the first day.
(c) Among the three, Lahur had the lowest success rate on the first day.
(d) Among the three, Tohri had the highest success rate on the second day.

QUANTITATIVE APTITUDE

45. The number of distinct integer values of n satisfying $\frac{4-\text{Log}_3 n}{3-\text{Log}_4 n} < 0$, is

46. The number of integers greater than 2000 that can be formed with the digits 0, 1, 2, 3, 4, 5, using each digit at most once, is
(a) 1200 (b) 1420
(c) 1440 (d) 1480

47. Suppose for all integers x, there are two functions f and g such that f(x) + f(x - 1) - 1 = 0 and $g(x) = x^2$. If $f(x^2 - x) = 5$, then the value of the sum f(g(5)) + g(f(5)) is

48. There are two containers of the same volume, first container half-filled with sugar syrup and the second container half-filled with milk. Half the content of the first container is transferred to the second container, and then the half of this mixture is transferred back to the first container. Next, half the content of the first container is transferred back to the second container. Then the ratio of sugar syrup and milk in the second container is
(a) 5 : 6 (b) 4 : 5
(c) 5 : 4 (d) 6 : 5

49. Consider the arithmetic progressions 3, 7, 11, ... and let An dentoe the sum of the first n terms of this progression. Then the value of $\frac{1}{25}\sum_{n=1}^{25} A_n$
(a) 415 (b) 404
(c) 455 (d) 442

50. If a and b are non-negative real numbers such that a + 2b = 6, then the average of the maximum and minimum values of (a + b) is:
(a) 4 (b) 4.5
(c) 3.5 (d) 3

51. Mr. Pinto invests one-fifth of his capital at 6%, one-third at 10% and the remaining at 1%, each rate being simple interest per annum. Then, the minimum number of years required for the cumulative interest income from these investments to equal or exceed his initial capital is

52. Working alone, the times taken by Anu, Tanu and Manu to complete any job are in the ratio 5 : 8 : 10. They accept a job which they can finish in 4 days if they all work together for 8 hours per day. However, Anu and Tanu work together for the first 6 days, working 6 hours 40 minutes per day. Then, the number of hours that Manu will take to complete the remaining job working alone is:

53. For some natural number n, assume that (15,000)! is divisible by (n!)!. The largest possible value of n is:
(a) 6 (b) 5
(c) 7 (d) 4

54. The average of a non-decreasing sequence of N number $a_1, a_2, \ldots, a_N$ is 300. If a1 is replaced by $6a_1$, the new average becomes 400. Then, the number of possible values of a_1 is

55. Let f(x) be a quadratic ploynomial in x such that f(x) ≥ 0 for all real numbers x. If f(2) = 0 and f(4) = 6, then f(-2) is equal to
(a) 24 (b) 6
(c) 36 (d) 12

56. Let r and c be real numbers. If r and -r are roots of $5x^3 + cx^2 - 10x + 9 = 0$, then c equals
(a) 4 (b) -9/2
(c) -4 (d) 9/2

57. Manu earns ₹4000 per month and wants to save an average of ₹550 per month in a year. In the first nine months, his monthly expense was ₹3500, and he foresees that, tenth month onward, his monthly expense will increase to ₹3700. In order to meet his yearly savings target, his monthly earnings, in rupees, from the tenth month onward should be:
(a) 4400 (b) 4300
(c) 4200 (d) 4350

58. Five students, including Amit, appear for an examination in which possible marks are integers between 0 and 50, both inclusive. The average marks for all the students is 38 and exactly three students got more than 32. If no two students got the same marks and Amit got the least marks among the five students, then the difference between the highest and lowest possible marks of Amit is
(a) 24 (b) 20
(c) 21 (d) 22

59. The number of integral solutions of the equation $(x^2 - 10)^{(x^2-3x-10)} = 1$ is:

60. In an election, there were four candidates and 80% of the registered voters casted their votes. One of the candidates received 30% of the casted votes while the other three candidates received the remaining casted votes in the proportion 1 : 2 : 3. If the winner of the election received 2512 votes more than the candidate

with the second highest votes, then the number of registered voters was:

(a) 60288 (b) 50240
(c) 40192 (d) 62800

61. In an examination, there were 75 questions. 3 marks were awarded for each correct answer, 1 mark was deducted for each wrong answer and 1 mark was awarded for each unattempted question. Rayan scored a total of 97 marks in the examination. If the number of unattempted questions was higher than the number of attempted questions, then the maximum number of correct answers that Rayan could have given in the examination is:

62. In triangle ABC, altitudes AD and BE are drawn to the corresponding bases. If $\angle BAC = 45°$ and $\angle ABC = \theta$, then AD/BE equals

(a) 1 (b) $\sqrt{2}\cos\theta$
(c) $\sqrt{2}\sin\theta$ (d) $\frac{\sin\theta + \cos\theta}{\sqrt{2}}$

63. Regular polygons A and B have number of sides in the ratio 1 : 2 and interior angles in the ratio 3 : 4. Then the number of sides of B equals

64. On day one, there are 100 particles in a laboratory experiment. On day n, where n greater than or 2, one out of every n particles produces another particle. If the total number of particles in the laboratory experiment increases to 1000 on day m, then m equals.

(a) 16 (b) 17
(c) 19 (d) 18

65. Two ships meet mid-ocean, and then, one ship goes south and the other ship goes west, both travelling at constant speeds. Two hours later, they are 60 km apart. If the speed of one of the ships is 6 km per hour more than the other one, then the speed, in km per hour, of the slower ship is

(a) 18 (b) 24
(c) 12 (d) 20

66. The length of each side of an equilateral triangle ABC is 3 cm. Let D be a point on BC such that the area of triangle ADC is half the area of triangle ABD. Then the length of AD, in cm, is

(a) $\sqrt{7}$ (b) $\sqrt{6}$
(c) $\sqrt{5}$ (d) $\sqrt{8}$

ANSWER KEY AND EXPLANATIONS

VERBAL ABILITY AND READING COMPREHENSION

1. **(a)**
2. **(b)**
3. **(c)**
4. **(c)**
5. **(b)**
6. **(c)**
7. **(a)**
8. **(d)**
9. **(b)**
10. **(c)**
11. **(c)**
12. **(b)**
13. **(c)**
14. **(a)**
15. **(c)**
16. **(a)**
17. (2143) 21 is a clear link: 2 states that biodiversity loss and ecosystem collapse are caused by myriad and diverse reasons; 1 expands on this idea. 21 leads on to the conclusion in 4 that our environmental crisis requires large political solutions, not minor technological ones. 4 leads on to 3, which describes what should be done as the next step. So, 2143 is the correct order.
18. **(d)**
19. **(d)**
20. **(c)**
21. **(c)**
22. **(c)**
23. **(2431)**
24. **(3142)**

DATA INTERPRETATION AND LOGICAL REASONING

25. **(35)** This questions, was discarded by IIM Bangalore.
A cannot be the last city to be visited while satisfying all the conditions given in the caselet.
Explanation: Demand
A – 50 (40%); 70 (60%)
B – 40 (30%); 60 (70%)
C – 70 (30%); 100 (70%)
D – 30 (40%); 50 (60%)
For Ahmednagar to be last, it should have the least demand of the 4 cities.
⇒ The only way Ahmednagar's demand can be the least of the 4 cities is when its demand is 50.Now, demand of all other cities should be greater than or equal to 50.
⇒ Demand atB = 60
C = 70 or 100
D = 50
∴ Sequence of cities according to demand will be C → B → D → ADistance travelled from
Warehouse → C = 12C → B = 4
B → W → D = 12
D → W → A = 7 [shortest route from D to A is through Warehouse and not the direct route]
∴ Total distance travelled = 12 + 4 + 12 + 7 = 35.
Ambiguity: There is some ambiguity in this question.
Once you reach B, demand at both A and D is same (i.e., 50). You would go thenearest of A and D which is A and hence A cannot be the last city to be visited then.
Hence, this question was discarded.
Note: The answer given by IIM-B in the cadidate response sheet was 35.
26. **(38)** Demand
A – 50 (40%); 70 (60%)
B – 40 (30%); 60 (70%)
C – 70 (30%); 100 (70%)
D – 30 (40%); 50 (60%)
Maximum demand possible = 70 + 60 + 100 + 50 = 280
Actual demand is 250. This is possible only when demand at C is 70 instead of 100.
∴ Actual demands at various cities is:
A → 70
B → 60
C → 70
D → 50
Sequence of cities visited is: A → C → B → D
A is closer to warehouse than C, hence first city to be visited will be A.]
∴ Total distance travelled = 5 + 17 + 4 + 12 = 38.
Hence, 38.
27. **(a)** Demand
A – 50 (40%); 70 (60%)
B – 40 (30%); 60 (70%)
C – 70 (30%); 100 (70%)
D – 30 (40%); 50 (60%)
For route to end at B, B should have least demand i.e., 40.
Total demand is 260, hence demand at other cities should be higher of the two values.
∴ Demand at A = 70 (60%)Demand at B = 40 (30%)
Demand at C = 100 (70%)
Demand at D = 50 (60%)
∴ Required possibility = 60% × 30% × 70% × 60%
= 0.6 × 0.3 × 0.7 × 0.6 = 0.0756 = 7.56%
Hence, option (a).
28. **(c)** Demand
A – 50 (40%); 70 (60%)
B – 40 (30%); 60 (70%)
C – 70 (30%); 100 (70%)
D – 30 (40%); 50 (60%)
If first city visited is Ahmednagar, this is possible when A's demand is highest. This is only possible when A's demand is 70.
∴ Demand at C should be 70Demand at B = 40 or 60
Demand at D = 30 or 50
∴ Sequence of cities can be
A → C → B → D: distance travelled = 38 kmsA → C → D → B: distance travelled = 40 kms
∴ Demand at D ≥ B
⇒ Demand at D = 50 (60%) and demand at B = 40 (30%)
⇒ Required possibility = 60% × 30% = 18%Hence, option (c).
29. **(a)** Demand
A – 50 (40%); 70 (60%)
B – 40 (30%); 60 (70%)
C – 70 (30%); 100 (70%)

D – 30 (40%); 50 (60%)
If A is not the first city to be visited, the first city will have to be C.Distance travelled from Warehouse to C = 12 kms.
∴ To visit the remaining 3 cities, distance travelled should be (29 – 12 =) 17 kms.There are two possibilities for this.
Case 1: W → C → B → A → DHere,
highest demand is from C i.e., 70 or 1002nd highest demand is from B i.e., 60 3rd highest demand is from A i.e., 50
4th highest demand is from D i.e., 30
Total widgets delivered can be 210 or 240Case 2: W → C → D → A → B
Here,
highest demand is from C i.e., 70 or 1002nd highest demand is from D i.e., 50 3rd highest demand is from A i.e., 50
4th highest demand is from B i.e., 40
Total widgets delivered can be 210 or 240.
[**Note**: shortest route from A to D or vice-versa is through the warehouse.] Hence, option (a).

30. **(40)** There were equal numbers of domestic and foreign products.
∴ There will be 160 foreign as well as domestic products.

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic							
Nutrition							

Half of the domestic products were FDA approved cosmetic products.
∴ 80 products are domestic, FDA approved and cosmetic products.

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic					80		
Nutrition							

None of the foreign products had both the approvals while 60 domestic products had both the approvals.

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic		0			80		
Nutrition		0			60		

There were 140 nutrition products, half of them were foreign products.
∴ Number of cosmetic products = 320 – 140 = 180

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic		0			80		180
Nutrition		0			60		140
		70			70		

There were 200 FDA approved products, 70 of them were foreign productsFDA approved products = FDA foreign + FDA domestic
⇒200 = 70 + (60 + only FDA domestic products)
⇒ only FDA domestic products = 70

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic		0			80		180
Nutrition		0					140

70 70 60 70 70

and 120 of them were cosmetic products.
FDA approved cometic products = FDA approved foreign cosmetic + FDA approved domestic cosmetic
⇒ 120 = (0 + only FDA approved cosmetic foreign products) + 80
⇒ only FDA approved cosmetic foreign products = 40
Since there are total 70 foreign FDA approved products out of which 40 are only FDA approved cosmetic foreign products, henceapproved nutrition foreign products = 70 – 40 = 30.
⇒ only EU approved nutrition foreign products = 70 – 30 = 40

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic		0	40		80		180
Nutrition	40	0	30				140

70 70 60 70 70

Total foreign products = 160
⇒ only EU approved cosmetic foreign products = 160 – 40 – 30 – 40 = 50

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic	50	0	40		80		180
Nutrition	40	0	30				140

70 70 60 70 70

Total Cosmetic products is 180 = cosmetic foreign + cosmetic domestic
⇒ 180 = (50 + 0 + 40) + (only EU approved domestic cosmetic products + 80)
⇒ only EU approved domestic cosmetic products = 10

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic	50	0	40	10	80		180
Nutrition	40	0	30				140

70 70 60 70 70

Total domestic products = 160 = (10 + only EU nutrition domestic products) + 60 + 70

⇒ only EU nutrition domestic products = 20

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic	50	0	40	10			180
Nutrition	40	0	30	20			140

With the given information we can tabulate this much.

∴ Number of foreign FDA approved cosmetic products = 0 + 40 = 40Hence, 40.

31. **(a)** Consider the solution to first question of this set.
Number of cosmetic products that did not have FDA approval = 50 + 10 = 60Hence, option (a).

32. **(b)** Consider the solution to first question of this set.
Domestic products which have both approvals = 60.
∴ Domestic cosmetic products with both approvals cannot be more than 60.
Maximum only FDA approved cosmetic domestic products can be 70, hence minimum cosmetic domestic products with both approvalscan be 10.
Hence, option (b).

33. **(c)** Consider the solution to first question of this set.We have:
If 70 cosmetic products did not have EU approval, then number of nutrition products with both approvals = only FDA approvedcosmetic (foreign + domestic) products

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic	50	0	40	10			180
Nutrition	40	0	30	20			140

⇒ 70 = 40 + only FDA approved cosmetic domestic products
⇒ only FDA approved cosmetic domestic products = 30
We can fill the remaining table as follows.

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic	50	0	40	10	50	30	180
Nutrition	40	0	30	20	10	40	140

Number of nutrition products with both approvals = 0 + 10 = 10
Hence, option (c).

34. **(50)** Consider the solution to first question of this set.
We have:

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic	50	0	40	10			180
Nutrition	40	0	30	20			140

50 nutrition products did not have EU approval = 30 + only FDA domestic nutrition products
⇒ only FDA domestic nutrition products = 20
We can fill the table as follows:
We have:

	Foreign (160)			Domestic (160)			
	EU	Both	FDA	EU	Both	FDA	
Cosmetic	50	0	40	10	30	50	180
Nutrition	40	0	30	20	30	20	140

∴ Number of domestic cosmetic products without EU approval = 50
Hence, 50.

35. **(b)** The given data can be tabulated as given below:
Income / Expense / Profit

	A			B			C			D		
	Income	Expense	Profit	Income	Expense	Profit	Income	Expense	Profit	Income	Expense	Profit
2019	90	85	5	100	75	25	25	20	5	50	40	10
2020	90	65	25	90	40	50	70	60	10	20	50	-30
2021	60	30	30	30	30	0	100	30	70	70	70	0

Employees

	A			B			C			D		
	Start	Join	End	Start	Join	End	Start	Join	End	Start	Join	End
2019	150	20	170	210	35	245	325	45	370	400	30	430
2020	140	35	175	240	45	285	325	40	365	410	35	445
2021	150	20	170	210	35	245	325	35	360	400	40	440

Cumulative profit of 3 years for
A = 5 + 25 + 30 = Rs. 60 crores profit
B = 25 + 50 + 0 = Rs. 75 crores profit
C = 5 + 10 + 70 = Rs. 85 crores profit
D = 10 – 30 + 0 = Rs. 20 crores loss Highest cumulative profit if for company C.
Hence, option (b).

36. **(c)** Consider the solution for first question of this set.
Company D suffered highest loss for any particular year in 2020.
Hence, option (c).

37. **(d)** Consider the solution for first question of this set.Ratio of (Annual profit) / (Annual Cost) in 2019 for
A = 5/85 = 1/17B = 25/75 = 1/3C = 5/20 = 1/4 D = 10/40 = ¼
This ratio is lowest for Company A.
Hence, option (a).

38. **(a)** Consider the solution for first question of this set.
Employees lost in 2019 and 200 for
A = (170 - 140) = 30
B = (245 - 240) = 5
C = (370 - 325) = 45
D = (430 - 410) = 20
Least number of employees left is least for B.
Hence, option (a).

39. **(a)** Consider the solution for first question of this set.Profit / (Average employee) ratio in 2020 for
Income / Expense / Profit

	A			B			C			D		
	Income	Expense	Profit	Income	Expense	Profit	Income	Expense	Profit	Income	Expense	Profit
2019	90	85	5	100	75	25	25	20	5	50	40	10
2020	90	65	25	90	40	50	70	60	10	20	50	-30
2021	60	30	30	30	30	0	100	30	70	70	70	0

Employees

	A			B			C			D		
	Start	Join	End	Start	Join	End	Start	Join	End	Start	Join	End
2019	150	20	170	210	35	245	325	45	370	400	30	430
2020	140	35	175	240	45	285	325	40	365	410	35	445
2021	150	20	170	210	35	245	325	35	360	400	40	440

$A = \frac{25}{\frac{176+170}{2}} = \frac{50}{345} = \frac{10}{69}$

$B = \frac{50}{\frac{285+245}{2}} = \frac{100}{530} = \frac{10}{53}$

$C = \frac{10}{\frac{365+360}{2}} = \frac{20}{725} = \frac{10}{362.5}$

$D = \frac{30}{\frac{445+440}{2}} = -\frac{60}{885}$

This ratio is highest for Company B.

Hence, option (a).

40. **(84)** From (4): Let Tohri visit x houses on day 1, hence he visits (x + 30) houses on day 2.

⇒ Total houses visited in 2 days = 2x + 30

Let Tohri visit n houses on day 2, hence he visits (100 – n) houses on day 1.

	Day 1			Day 2		
	Products sold	Houses visited	Success rate	Products sold	Houses visited	Success rate
Tohri	100 - n	x	$\frac{100-n}{x}$	n	x + 30	$\frac{n}{x+30}$
Hokli						
Lahur						

From (1) & (2): Lahur visited half the total houses on both days = x + 15From (2): Lahur sold half the products on each day = 50

	Day 1			Day 2		
	Products sold	Houses visited	Success rate	Products sold	Houses visited	Success rate
Tohri	100 - n	x	$\frac{100-n}{x}$	n	x + 30	$\frac{n}{x+30}$
Hokli						
Lahur	50	x + 15	$\frac{50}{x+15}$	50	x + 15	$\frac{50}{x+15}$

From (1) & (3): Hokli sold all 100 items on day 1, while he visited only 1 house on day 2. Hence, he visited (2x + 29) houses on day 1.

	Day 1			Day 2		
	Products sold	Houses visited	Success rate	Products sold	Houses visited	Success rate
Tohri	100 - n	x	$\frac{100-n}{x}$	n	x + 30	$\frac{n}{x+30}$
Hokli	100	2x + 29	$\frac{100}{2x+29}$	0	1	0
Lahur	50	x + 15	$\frac{50}{x+15}$	50	x + 15	$\frac{50}{x+15}$

From (5): $\frac{100-n}{x} = 2\ [\frac{50}{x+15}]$

$\Rightarrow 100x + 1500 - nx - 15x = 100x$

$\Rightarrow nx + 15x = 1500$

$\Rightarrow n = \frac{1500}{x+15}$ ... (1)

From (5): $\frac{n}{x+30} = \frac{3}{4}[\frac{50}{x+15}]$

$\Rightarrow 4nx + 60n = 150x + 4500$

$\Rightarrow 4x \times \frac{1500}{x+15} + 60 \times \frac{1500}{x+15} 150x + 4500$

$\Rightarrow 4x \times \frac{10}{x+15} + 60 \times \frac{10}{x+15} = x + 30$

$\Rightarrow 40x + 600 = (x + 15)(x + 30)$

$\Rightarrow 40x + 600 = x^2 + 45x + 450$

$\Rightarrow x^2 + 5x - 150 = 0$

$\Rightarrow (x + 15)(x - 10) = 0$

$\Rightarrow x = 10\ (-15\ is\ rejected)$

From (1)

$\Rightarrow n = \frac{1500}{x+15} = 60$

∴ The table can be filled as follows :

	Day 1			Day 2		
	Products sold	Houses visited	Success rate	Products sold	Houses visited	Success rate
Tohri	100 - n	x	$\frac{100-n}{x}$	n	x + 30	$\frac{n}{x+30}$
Hokli	100	2x + 29	$\frac{100}{2x+29}$	0	1	0
Lahur	50	x + 15	$\frac{50}{x+15}$	50	x + 15	$\frac{50}{x+15}$

∴ Total number of households met by Tohri, Hokli and Lahur on the first day = 10 + 49 + 25 = 84.Hence, 84.

41. **(40)** Consider the solution to first question of this set.
TRICCEK items were sold by Tohri on the first day = 40.
Hence, 40.

42. **(b)** Consider the solution to first question of this set.
Number of households met by Lahur on 2nd day = 25.
Hence, option (b).

43. **(b)** Consider the solution to first question of this set.
Number of households met by Tohri on 1st day = 10.
Hence, option (b).

44. **(d)** Consider the solution to first question of this set.Option (d) is wrong.
Hence, option (d).

QUANTITATIVE APTITUDE

45. **(47)** Given, $(\frac{4-\log_2 n}{3-\log_4 n}) < 0$

Case 1: $4 - \log_2 n < 0\ and\ 3 - \log_4 n > 0$

$\Rightarrow \log_2 n > 4\ and\ Log_4 n < 3$

$\Rightarrow n > 16\ and\ n < 64$

∴ integral values of n can be 17, 18, ..., 63 i.e., 47 values.

Case 2: $4 - \log_2 n > 0\ and\ 3 - \log_4 n < 0$

$\Rightarrow \log_2 n < 4\ and\ \log_4 n > 3$

⇒ n < 16 and n > 64

∴ No integral values of n is possible.

Hence, 47.

46. **(c) Case 1:** Number of 4-digit numbers

Here,
unit's digit can be either 2, 3, 4 or 5 i.e., 4 ways,
ten's digit can be chosen from remaining 5 numbers in 5 ways,

hundred's digit can be chosen from remaining 4 numbers in 4 ways. thousand's digit can be chosen from remaining 3 numbers in 3 ways.
⇒ Total such 4-digit numbers = 4 × 5 × 4 × 3 = 240
Case 2: Number of 5-digit numbers
Here,
__ __ __ __ __
unit's digit can be either 1, 2, 3, 4 or 5 i.e., 5 ways,
ten's digit can be chosen from remaining 5 numbers in 5 ways,
hundred's digit can be chosen from remaining 4 numbers in 4 ways.
thousand's digit can be chosen from remaining 3 numbers in 3 ways.
ten thousand's digit can be chosen from remaining 2 numbers in 2 ways.
⇒ Total such 5-digit numbers = 5 × 5 × 4 × 3 × 2 = 600
Case 2: Number of 6-digit numbers
Here,
__ __ __ __ __
unit's digit can be either 1, 2, 3, 4 or 5 i.e., 5 ways,
ten's digit can be chosen from remaining 5 numbers in 5 ways,
hundred's digit can be chosen from remaining 4 numbers in 4 ways.
thousand's digit can be chosen from remaining 3 numbers in 3 ways.
ten thousand's digit can be chosen from remaining 1 number in 1 way. One lakh's digit
⇒ Total such 6-digit numbers = 5 × 5 × 4 × 3 × 2 × 1 = 600
∴ Total required numbers = 240 + 600 + 600 = 1440. Hence, option (c).

47. **(12)** $f(x^2 - x) = 5$
put x = 0 ⇒ f(0) = 5
Given f(x) + f(x – 1) – 1 = 0
⇒ f(x) = 1 – f(x - 1) ...(1)
put x = 1 in (1)
⇒ f(1) = 1 – f(0)
⇒ f(1) = 1 – 5 = -4
Put x = 2 in (1)
⇒ f(2) = 1 – f(1) = 1 – (-4) = 5
∴ f(odd value of x) = -4 & f(even value of x) = 5
Now, we have f(g(5)) + g(f(5))
⇒ f(g(5)) + g(f(5)) = f(52) + g(-4)
⇒ f(g(5)) + g(f(5)) = f(25) + 16
⇒ f(g(5)) + g(f(5)) = -4 + 16
⇒ f(g(5)) + g(f(5)) = 12
Hence, 12.

48. **(a)** Let container A initially have 100 liters of sugar while container B have 100 liters of milk.

	A		B	
	Sugar	Milk	Sugar	Milk
Initially	100	0	0	100
After 1st transfer	50	0	50	100

Now the second container has sugar and milk in the ratio of 1 : 2.
When half i.e., 75 liters of it is transferred, 25 liters of sugar and 50 liters of milk will be transferred.

	A		B	
	Sugar	Milk	Sugar	Milk
Initially	100	0	0	100
After 1st transfer	50	0	50	100
After 2nd transfer	75	50	25	50

Now the first container has sugar and milk in the ratio of 3 : 2.
When half i.e., 62.5 liters of it is transferred, 37.5 liters of sugar and 25 liters of milk will be transferred.

	A		B	
	Sugar	Milk	Sugar	Milk
Initially	100	0	0	100
After 1st transfer	50	0	50	100
After 2nd transfer	75	50	25	50
After 3rd transfer	37.5	25	62.5	75

∴ Ratio of sugar and milk in 2nd container = 62.5 : 75 = 625 : 750 = 25 : 30 = 5 : 6 Hence, option (a).

49. **(c)** $A_n = 3 + 7 + 11 + \cdots$
$\Rightarrow A_n = \frac{n}{2}[2 \times 3 + (n-1) \times 4] = \frac{n}{2}[4n + 2] = 2n^2 + n$
Now, $\frac{1}{25}\sum_{n=1}^{25} [2n^2 + n]$
$= \frac{1}{25}[2 \times (\frac{25 \times 26 \times 51}{6}) + (\frac{25 \times 26}{2})]$
$= \frac{1}{25}[25 \times 26 \times 17 + 25 \times 13]$
$= 26 \times 17 + 13 = 455$
Hence, option (c).

50. **(b)** Given, a + 2b = 6.
⇒ a + b = 6 - b
∴ (a + b) will be maximum when b is least. Least value of b can be 0, since b cannot be negative.
⇒ $(a + b)_{max} = 6$
∴ (a + b) will be minimum when b is highest. Highest value of b can be 3, since a cannot be negative.
⇒ $(a + b)_{min} = 3$
⇒ Average of highest and lowest values of (a + b) = $\frac{3+6}{2} = 4.5$
Hence, option (b).

51. **(20)** Let the total investment be Rs. 1500.
⇒ Rs. 300 is invested at 6% ⇒ Interest/year = Rs. 18
⇒ Rs. 500 is invested at 10% ⇒ Interest/year = Rs. 50
⇒ Rs. 700 is invested at 1% ⇒ Interest/year = Rs. 7
∴ Total interest received/year = 18 + 50 + 7 = Rs. 75
⇒ Time required to receive Rs. 1500 as interest = $\frac{1500}{75}$ =20 years.
Hence, 20.

52. **(6)** Ratio of time taken by Anu, Tanu and Manu is 5 : 8 : 10.
⇒ Ratio of efficiencies of Anu, Tanu and Manu = $\frac{1}{5} : \frac{1}{8} : \frac{1}{10}$ = 8: 5: 4
Let their efficiencies be 8x, 5x and 4x respectively per hour.
Total work done by them in 4 days = (8x + 5x + 4x) × 4 × 8 = 17x × 32 = 544x
Now, Anu and Tanu worked by 6 days working 6 hours 40 minute i.e., $6\frac{2}{3}$ hours daily.
∴ Worked completed by Anu and Tanu = $13x \times 6 \times \frac{20}{3}$ = $520x$

⇒ Time taken by Manu to complete the remaining work = $\frac{544x-520x}{4x}$ = 6 hours.
Hence, 6.

53. **(c)** For (15,000)! to be completely divisible by (n!)!, n! ≤ 15,000
Now we know,
6! = 720
7! = 5,040
8! = 40,320
∵ n ≤ 15,000, highest value n can take is 7.
Hence, option (c).

54. **(14)** Given, $\frac{a1+a1+\cdots+aN}{N} = 300$
$\Rightarrow a_1 + a_2 + \cdots + a_N = 300\ N$
Also, $\frac{6s2+a1+\cdots+sx}{N} = 400$
$\Rightarrow 63_1 + a_2 + \cdots + a_N = 400\ N$
(2) - (1)
$\Rightarrow 5a_1 = 100\ N$
$\Rightarrow a_1 = 20\ N$
Since, a_1 is the least of the given numbers it cannot be more than the average, hence $a_1 \leqslant 300$.
$\Rightarrow N \leq 15$
If $N = 1$, $a_1 = 20$ and average cannot be equal to 300.
Hence, N can take all values from 2 till 15, ie, 14 values.
Hence, 14.

55. **(a)** Let $f(x) = ax^2 + bx + c$
Since, f(x) ≥ 0, and f(2) = 0, it means the graph of the quadratic lies above x-axis and touches x-axis at x = 2.
Since x = 2 is the only root of the equation (i.e., graph is symmetric about x = 2),
⇒ f(2 + a) = f(2 – a)
⇒ f(2 + 2) = f(2 - 2)
⇒ f(4) = f(0)
⇒ f(0) = 6
⇒ c = 6
f(2) = 0
⇒ 4a + 2b + c = 0
⇒ 4a + 2b = -6 ...(2)
f(4) = 6
⇒ 16a + 4b + c = 6
⇒ 16a + 4b = 0 ...(3)
Solving (2) and (4), we get a = -3/2 and b = -6
$\Rightarrow a = -\frac{3}{2} and\ b = -6$
$\Rightarrow f(-2) = \frac{3}{2}(-2)^2 - 6 \times -2 + 6 = 6 + 12 + 6 = 24$
Hence, option (a).

56. **(b)** In a polynomial $ax^3 + bx^2 + cx + d = 0$, whose roots are α, β and γ.
⇒ α + β + γ = -b/a
⇒ αβ + βγ + γα = c/a
⇒ αβγ = -d/a
If roots of $5x^3 + cx^2 - 10x + 9 = 0$, r, -r and γ
⇒ r – r + γ = -c/5
⇒ γ = -c/5 ...(1)
⇒ r × -r + r × γ – r × γ = (-10)/5 = -2
⇒ $r^2 = 2$ ...(2)
⇒ r × - r × γ = -(9/5)
⇒ r^2 × γ = 9/5
⇒ γ = 9/10 ...(3)
From (1) and (3)
⇒ -c/5 = 9/10
⇒ c = -9/2
Hence, option (b).

57. **(a)** Monthly savings of Manu = Rs. 550
⇒ Yearly savings of Manu = 12 × 550 = Rs. 6,600
Total expense of Manu for the first 9 months = 9 × 3500 = Rs. 31,500 Total expense of Manu for the last 3 months = 3 × 3700 = 11,100
⇒ Yearly expense of Manu = 11,100 + 31,500 = Rs. 42,600
Monthly income of Manu = Rs. 4,000
⇒ Income of Manu for first 9 months = 9 × 4000 = Rs. 36,000
⇒ Manu's income for last 3 months = 42,600 + 6,600 – 36,000 = Rs. 13,200
⇒ Monthly income of Manu for last 3 months = $\frac{13200}{3}$ = Rs. 4,400
Hence, option (a).

58. **(b)** Total marks of all 5 students = 5 × 38 = 190
Case 1: Least marks of Amit.
To minimize Amit's marks we should maximize the marks of other 4 students.
⇒ 3 students get more than 32, hence their maximum marks can be 48, 49 and 50. [Marks are distinct]
2 students (including Amit) scored less than or equal to 32.
⇒ Maximum marks of 2nd student can be 32
∴ Sum of marks of these 4 students = 32 + 48 + 49 + 50 = 179
⇒ Least marks of Amit = 190 – 179 = 11
Case 2: Maximum marks of Amit.
Since Amit and one other student scored less than or equal to 32 marks, maximum marks Amit can score is 31. [Amit scored least and all scores are distinct.]
∴ Difference between highest and least score of Amit = 31 – 11 = 20 Hence, option (b).

59. **(4)** Given, $(x^2 - 10)^{x^2-3x-10}$
For this to be equal to 1
Case 1: $x^2 - 10 = 1$
$\Rightarrow x = \sqrt{11}$
Rejected as x is not an integer.
Case 2: $x^2 - 3x - 10 = 0$
$\Rightarrow (x - 5)(x + 2) = 0$
$\Rightarrow x = 5$ or -2 i.e., 2 integral values of x.
Case 3: $x^2 - 10 = -1$ and $x^2 - 3x - 10 =$ even
If $x^2 - 10 = -1 \Rightarrow x = \pm 3$
For both $x = +3$ and $-3x^2 - 3x - 10$ is even, hence, 2 integral values of x.
⇒ Total 4 integral values of x are possible.
Hence, 4.

60. **(d)** Let the total number of registered voters be 100x.
Number of votes casted = 80x
Votes for Candidate 1 = 30% of 80x = 24x
∴ Remaining three candidates will recieve = 80x - 24x = 56x votes.
Remaining 3 candidates get votes in the ratio of 1 : 2 : 3 of the remaining 56x votes.
$\Rightarrow$ Votes of candidate $2 = \frac{1}{6} \times 56x = \frac{28x}{3}$
$\Rightarrow$ Votes of canditate $3 = \frac{2}{6} \times 56x = \frac{56x}{3}$
$\Rightarrow$ Votes of candidate $4 = \frac{3}{6} \times 56x = 28x$

Highest number of votes is received by Candidate 4 while second highest is by Candidate 1.
⇒ 28x – 24x = 2512
⇒ x = 2512/4 = 628
∴ total number of registered votes = $100x = 62800$
Hence, option (d).

61. **(24)** Let the number of correct, wrong and un-attempted questions be c, w and u respectively. Since u > c + w
⇒ u > 75 - u
⇒ u > 37.5
∴ Least possible value of u is 38
⇒ c + w + u = 75 ...(1)
⇒ 3c – w + u = 97 ...(2)
(2) + (1)
⇒ 4c + 2u = 172
⇒ 2c + u = 86
⇒ 2c = 86 - u

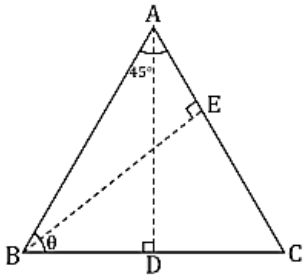
c will be greatest when u is least i.e., u = 38
⇒ 2c = 86 - 38 = 48
⇒ c = 24
∴ Maximum value c can take is 24. Hence, 24.

62. **(c)**

Explanation :

Area of ΔABC = $\frac{1}{2} \times AB \times AC \times \sin 45° = \frac{AB \times AC}{\sqrt{2}}$ ...(1)

Area of ΔABC = $\frac{1}{2} \times BA \times BC \times \sin \theta° = \frac{BA \times BC \times \sin \theta}{2}$ ...(2)



(1) = (2)

$\Rightarrow \frac{AB \times AC}{\sqrt{2}} = \frac{BA \times BC \times \sin \theta}{2}$

$\Rightarrow AC = \frac{BC \times \sin \theta}{\sqrt{2}}$ ...(3)

Area of ΔABC = $\frac{1}{2} \times AD \times BC = \frac{1}{2} \times AC \times BE$

$\Rightarrow \frac{AD}{BE} = \frac{AC}{BC}$

$\Rightarrow \frac{AD}{BE} = \frac{BC \times \sin \theta}{\sqrt{2} \times BC} = \frac{\sin \theta}{\sqrt{2}}$

Hence, option (b).

63. **(10)** Interior angle of a n-sided regular polygon = $\frac{(n-2) \times 180°}{n}$

Let the number of sides of polygon A and B be n and 2n respectively.

$\Rightarrow \frac{\frac{(n-2) \times 180^0}{n}}{\frac{(2n-2) \times 180^0}{2n}} = \frac{3}{4}$

$\Rightarrow \frac{n-2}{n-1} = \frac{3}{4}$

$\Rightarrow 4n - 8 = 3n - 3$

$\Rightarrow n = 5$

∴ Number of sides of polygon B = 2n= 10.
Hence, 10.

64. **(c)** On nth day 'n' particles produce 1 extra particle.
⇒ For every n particles on previous day, their will be (n + 1) particles next day.
∴ On nth day, the number of particles will become $\frac{n+1}{n}$ times the number of particles of previous day.

⇒ Number of particles after day 2 $= 100 \times (\frac{3}{2})$

⇒ Number of particles after day 3 $= 100 \times (\frac{3}{2}) \times (\frac{4}{3})$

⇒ Number of particles after day 4 $= 100 \times (\frac{3}{2}) \times (\frac{4}{3}) \times (\frac{5}{4})$

⇒ Number of particles after day m $= 100 \times (\frac{3}{2}) \times (\frac{4}{3}) \times (\frac{5}{4}) \times \ldots \times (\frac{m+1}{m}) = 100 \times (\frac{m+1}{2})$

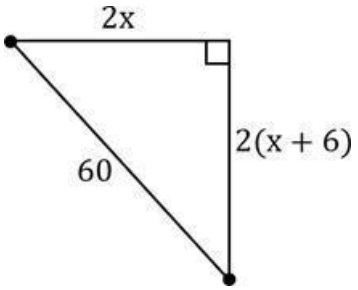
$\Rightarrow 100 \times (\frac{m+1}{2}) = 1000$

$\Rightarrow (\frac{m+1}{2}) = 10$

$\Rightarrow m = 19$

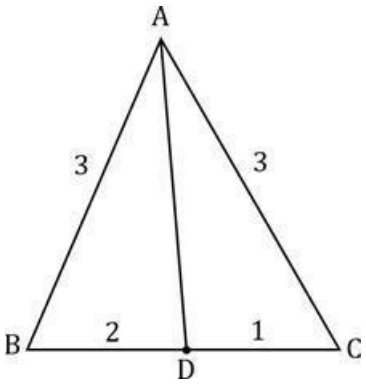
Hence, option (c).

65. **(a)** Let the speed of the slower ship be x km/hr. Distance travelled by it in 2 hours = 2x kms
Speed of faster ship = (x + 6) km/hr.
Distance travelled by it in 2 hours = 2(x + 6) kms



$\Rightarrow (2x)^2 + (2(x + 6))^2 = (60)2$
$\Rightarrow 4x^2 + 4(x^2 12x + 36) = 3600$
$\Rightarrow 8x^2 + 48x + 144 = 3600$
$\Rightarrow 8x^2 + 48x - 3456 = 0$
$\Rightarrow x^2 + 6x - 432 = 0$
$\Rightarrow (x + 24)(x - 18) = 0$
$\Rightarrow x = 18$ (−24 is rejected)
∴ Speed of slower person is 18 km/hr Hence, option (a).

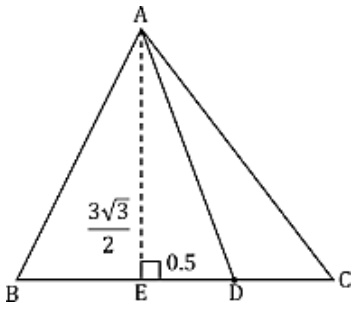
66. **(a)** Area of ΔACD is half of area of ΔABD.
Since their height is same, ratio of their areas will be same as the ratio of their bases.
⇒ BD = 2CD
⇒ BD = 2 cm and CD = 1 cm.



Taking E as the midpoint of BC, BE = 3/2 = 1.5

$\Rightarrow$ ED $= 2 - 1.5 = 0.5$ cm.

Also, AE $=$ height of the equilateral triangle $= \frac{\sqrt{3}}{2} \times 3 = \frac{3\sqrt{3}}{2}$



In ΔAED

$\Rightarrow AD^2 = AE^2 + ED^2$

$\Rightarrow AD^2 = \left(\frac{3\sqrt{3}}{2}\right)^2 + (0.5)^2$

$\Rightarrow AD^2 = \frac{27}{4} + \frac{1}{4} = 7$

$\Rightarrow AD = \sqrt{7}$

Hence, option (a).