

1. Hypocritical is possessed by hypocrisy or falseness. There is nothing 'insincere' about what the author says here, therefore, option 4 (hypocritical) can be eliminated. Again, while asking that, the author does not make a cutting or sarcastic remark (caustic), nor is it critical (disapproving or fault-finding) although the author does point out a little fault. The author here wittily puts forth the idea that no French winemaker is ever going to admit that his wine is not as good as the best wines of California or South Australia. Since, he uses wit to point that out, satire is the best word here. Hence, the correct answer is **option 2**.
2. In the fourth paragraph, the author indicates that Cabernet Sauvignon or Chardonnay was known names to the English. Therefore, in present times when wine has reached more people, the names have become synonymous with great tasting wines or become a brand. In the fifth paragraph, it is written that the French do not call their wines by these names and hence are scared by this trend of consumers to recognise those wines as good. (What would happen to their wines?). It follows that if the French follow such labelling strategies, consumers would be biased towards those wines they have heard of or can relate to. That leads us to option 1.  
As the author puts it in the fifth paragraph- "Some areas, in the middle of southern France, have now produced a generation of growers using the varietal names on their labels and are tempting consumers back to French wine. It will be an uphill struggle, but there is probably no other way if France is to avoid simply becoming a specialty source of old-fashioned wines for old-fashioned connoisseurs."  
Option 4 does not hold because the author has said earlier that French classics were popular in England. Options 2 and 3 can be eliminated by looking at the information in the fourth and fifth paragraphs.  
Hence, the correct answer is **option 1**.
3. The name of the grape from which wine is made is recognized by customers. Customers therefore have acquired a basic lexicon and French winemakers are scared of that trend.  
Option 2 effectively summarises that by pointing out this acquired 'education'.  
Option 1 can be ruled out because the winemakers are scared of the trend among the customers not the tendency to not name wines after the grape varieties. Nor are they are scared of local winegrowers who show names of grape varieties on their bottles (option 3).  
Option 4 is partially true, but the idea is the increase in awareness level among customers.  
Hence, the correct answer is **option 2**.
4. As stated in the last paragraph, Dr. Serge Renaud found that the fat-derived cholesterol that builds up in the arteries and can eventually lead to heart trouble can be dispersed by the tannins in wine. Tannin is derived from the skins of grapes, and is therefore present in higher levels in red wines.  
Option 4 supports this finding.  
Option 1 does not explicitly indicate that film celebrities drink red wine.  
Option 2 weakens the statement by stating that red wine drinkers have higher levels of coronary heart incidence. So does option 3.  
Option 3 states the opposite that red wine sales has a positive correlation with incidence of coronary heart disease.  
Hence, the correct answer is **option 4**.
5. Option 1 can be substantiated from the fourth paragraph.  
Option 2 can be deduced. Customers effectively recognize grape names and since information is given on bottles, ordinary customers can make better buying decisions.  
Option 4 can be drawn from paragraph 4 as well- "Consumers effectively recognize them as brand names, and have acquired a basic lexicon of wine that can serve them even when confronted with those Brazilian upstarts." However, nowhere there is mention of customer being able to recognize better quality wines. Wines have been spoken of in terms of grape varieties and not their quality.  
Hence, the correct answer is **option 3**.

6. The last paragraph clearly gives us the answer: "Churchill opposed this, and wanted to tax India rather than owe it money. But he was overruled by India hands who said India would resist payment, and paralyze the war effort." Britain was afraid to tax India as it could paralyse the war effort (option 3). Australia, Canada and New Zealand were paying the conquerors (option 1 ruled out) and not Indian troops. It has not been indicated in the passage that World War I payments were made to compensate for World War II (option 2 ruled out). Although what option 4 states is true according to the passage, but the premise did not work for India (option 4 ruled out). Hence, the correct answer is **option 3**.
7. The answer (option 3) has been outlined in the fourth paragraph: "An additional factor deterring loot was the 1857 Sepoy Mutiny. Though crushed, it reminded the British vividly that they were a tiny ethnic group who could not rule a gigantic subcontinent without the support of important locals." Option 1 is an outcome of this realisation and not a cause. Option 2 is not the main reason. Option 4 can be deduced by taking into account lots of other factors and not just the Sepoy mutiny. Hence, the correct answer is **option 3**.
8. The third paragraph states: "no immorality was attached to imperial loot and plunder ... . This mindset gradually changed with the rise of new ideas about equality and governing for the public good ... . The white man's burden came up as a new moral rationale for conquest. It was supposedly for the good of the conquered." Therefore, options 1, 3 and 4 have been stated as reasons for the emergence of the 'white man's burden' whereas profitability of the empire (option 2) has not been mentioned in this context. Hence, the correct answer is **option 2**.
9. The author indicates this in the third paragraph: "The white man's burden came up as a new moral rationale for conquest. It was supposedly for the good of the conquered." That is summed up in option 1 (claim to ... ensuring the good of the natives). Resource drain as a reason (option 3) has not been cited in this regard. Yes, the French and American revolutions had an influence and open looting by that time had become impossible but the best answer remains option 1 and that is why that supposed 'good' is called a burden. Hence, the correct answer is **option 1**.
10. The author's subject is India and, British imperialism. Therefore, although there is a mention of imperialism elsewhere, other countries have not been discussed in detail. Consequently, it is not a general case as pointed out by option 1. Thus, it can be eliminated. 'White man's burden' is part of the discussion and the entire passage is not dedicated to this discussion. Option 2, therefore, can be ruled out. Option 3 should be eliminated because the passage focuses on the cost part of empire building and sustenance. It does not dwell too much on the attractiveness part of it. In the passage, the author has been consistently speaking of how financial loss prompted the British to give up India (option 4). In the first paragraph: "This constituted a strong financial case for ending the no-longer-profitable empire." The author also sums up this idea in the final sentence of the passage, "it's not worth ruling over people you are afraid to tax." Hence, the correct answer is **option 4**.
11. Options 1 and 2 are pro- anti-GM lobby (in favour of anti-GM lobby) and hence can be eliminated. Option 4 has not been mentioned as a reason to doubt the anti-GM lobby's contention about MNC control and can be eliminated as well. In the sixth paragraph, the author says, "Even if the research promoted by them does focus on the high-value food items, much of biotechnology research is also funded by governments in both developing and developed countries." That implies that other than MNCs, there would be governments involved as well. In other words MNCs are not the only group of actors. Hence, the correct answer is **option 3**.
12. A wee bit of GK here will help. According to the passage, European nations are anti-GM. Of the countries mentioned in the options, Spain, Germany and France are European countries. That eliminates options 2 and 4. The second paragraph mentions that the genetically-modified food industry is particularly strong in the United States of America. This eliminates option 1. Hence, the correct answer is **option 3**.
13. In the last paragraph the author states: "farmers use massive dosages of weed-killers so as to destroy or wipe out all competing varieties of plants in their fields. However, some weeds through genetically modified pollen contamination may acquire resistance to a variety of weed-killers. The only way to destroy these weeds is through the use of ever-stronger

herbicides, which are poisonous and linger on in the environment." This idea is illustrated in option 2.

Soil fertility has not been mentioned in this regard (option 4 can be eliminated).

The herbicides cause the damage and not the plants (option 1 eliminated).

Option 3 does not adequately explain the reason for environmental damage.

Hence, the correct answer is **option 2**.

14. Options 1, 2 and 3 have been refuted by the author. Since there are other bodies like the government involved in GM research, the funding is not only by MNCs, not is the utility only for high value food items and finally nor does that give too much control to the MNCs.

Since governments of both developed and developing countries are involved in this, option 4 follows.

Hence, the correct answer is **option 4**.

15. There is an example in the passage (potato) of a GM product supported by the government which has not been sufficiently highlighted by the Indian media. Therefore, we can do away with option 4.

Option 3 is not supported by the information in the passage. No such case of media-government partnership has been depicted. Consequently, option 3 can be ruled out.

Since, the media has not highlighted news about GM research or controversies; we cannot deduce that Indian media's coverage is dependent on MNCs' interests (option 2 eliminated). Furthermore, in the third paragraph, the author states: "It is quite likely that the GM controversy will soon hit the headlines in India since a spokesperson of the Indian Central government has recently announced that the government may use the potato in its midday meal programme for schools as early as next year." That suggests that when a mass application of a scientific product is likely, then the media is interested in highlighting that product.

Hence, the correct answer is **option 1**.

16. To quote from the second and the third paragraphs, "These large gatherings will be only what we make of them if not anything better; they can be as good places to collect new friends from as the slave-markets of Istanbul were for beautiful slaves or New Market for race horses. But they do offer more immediate enjoyment." Here, the 'they' (in bold) clearly refers to large gatherings (option 1).

The author does refer to intimate meetings with friends in the second paragraph but they he/she moves

to large gatherings where one gets to meet strangers. Therefore, options 2, 3 and 4 are ruled out.

Hence, the correct answer is **option 1**.

17. All the options follow from the passage. But the one option and hence the answer which sums up options 1, 2 and 4 is option 3.

Because our real social life has dried up, our social life is shallow (option 1), lower middle class people cannot tolerate better off people (option 2) and upper classes resort to snobbery (option 4).

Also, the sentences in the passage does not indicate that the author is 'poking fun' at lower middle class people (option 2 can be eliminated). Additionally, the author explicitly states in the fifth paragraph that our real social life is drying up- "It is tragic, however, to observe that it is these very natural springs of social life which are drying up among us."

Hence, the correct answer is **option 3**.

18. The fourth paragraph states- "Interest, wonder, sympathy and love, the first two leading to the last two, are the psychological prerequisites for social life; and the need for the first two must not be underrated."

Here the author states how qualities like wonder and interest (option 2) can even make new friends out of old ones.

Option 3 is definitely out- not spending time is not the author's conception of 'social life'.

Options 1 and 4 are superficial in the sense they are secondary to the psychological requisites.

Hence, the correct answer is **option 2**.

19. Discriminate can mean, 1) differentiate, 2) judge wisely or 3) to make distinctions. That would give 'distinguish' as a likely answer. But when the context is- "And I would go further and paraphrase Pater to say that not to be able to discriminate every moment some passionate attitude in those about us...". Here, it means that 'not to be able to recognise in every moment some passionate attitude in those about us. That leads us to option 1.

Hence, the correct answer is **option 1**.

20. The fifth and sixth paragraphs state- it is not fair to generalise from one or two examples that everyone or crowds in poor Calcutta suburbs can turn violent without any provocation. Extreme opinions should be handled with care when it comes to choosing from options.

The author unmistakably states in the fifth paragraph that the grinding routine of the poor middle class has killed the desire for social life. That refutes option 2.

Again, with one or two stray incidents, we should not generalise that it is a risky proposition for the rich to move around in poor suburbs, although the option is attractive because of the examples given by the author. The best answer is option 4.

Hatred towards the upper class or towards people who are better off is present as has been highlighted by the author in the fifth and sixth paragraphs.

'Innocent exhibition of sociability' denotes their coming together as crowds.

Hence, the correct answer is **option 4**.

21. In the first paragraph, the author explicitly gives a reason for this: "To a certain extent this (Greeks not conducting experiments) may be attributed to the crudeness of their instruments of measurement." That leads us to option 3.

Options 1, 2 and 4 have not been stated in this context.

Hence, the correct answer is **option 3**.

22. The third paragraph is where the author emphasizes that the real significance of Newton's achievement lay in his having established the presence of law and order at least in one important realm of nature, namely, in the motions of heavenly bodies. That is, he provided a mathematical basis to explain physical phenomena (option 3) and that conformity gives proof that there is some rational basis about natural phenomena.

Options 1 and 2 can be refuted and option 4 does not apply (it is irrelevant).

Hence, the correct answer is **option 3**.

23. "The next advance was due to Newton, the greatest scientist of all time if account be taken of his joint contributions to mathematics and physics", so states the author in the beginning of the second paragraph. According to the author, the significance lies in the marriage of physics with mathematics to explain natural phenomena (option 2).

Options 1, 3 and 4 speak about definite aspects or specific contributions of Newton.

Hence, the correct answer is **option 2**.

24. Option 3 could be a contender but the integration of mathematics is but one part of the discussion given by the author.

We need to look for an idea, a theme which pervades the entire passage. The author begins the passage with the statement, "modern science, exclusive of geometry, is a comparatively recent creation and can be said to have originated with Galileo and Newton." With modern science, the author speaks about Einstein and sums up the passage with the last sentence as, "it is

most important to understand this point and to realize that Einstein's special principle is merely an extension of the validity of the classical Newtonian principle to all classes of phenomena." Therefore, the origin of new knowledge was existing knowledge (option 4).

Options 1 and 2 do not apply here.

Hence, the correct answer is **option 4**.

25. In the last paragraph, the author states: "its significance laid in its assertion that absolute Galilean motion or absolute velocity must ever escape all experimental detection." That means that Galilean motion or absolute velocity (some physical phenomena) cannot be experimentally ascertained (option 3).

Option 1 is true according to the passage but gives partial information (meaningless in the entire realm of physical phenomena not only mechanics). It also uses the past tense whereas the author speaks of it as a scientific fact.

Option 2 can be deduced if modification is understood as an extension or addition here but the statement is not a significant implication of Einstein's special principle of relatively.

Option 4 is not supported by the passage.

Hence, the correct answer is **option 3**.

26. Option 4 can be easily ruled out. Ithaca and Egyptian ports are synonymous to the destination and the stations in between respectively. The theme should reflect the metaphor inherent in the poem.

The poem is about undertaking an enriching journey and a prolonged one so that much wisdom can be gained on the way. Options 2 and 3 speak about that. But the idea is clearly outlined in option 2 which adds the part of not rushing to your goal but investing in the journey.

Option 1, in light of this information does not suffice.

Hence, the correct answer is **option 2**.

27. There is a reason to visit new cities and harbours as mentioned in option 1. It is to buy fine things as mentioned in option 4, experience sensuality as mentioned in option 3 and gain knowledge. In essence, gaining both enriching experience and sensual experience is the aim of the journey and option 1 most comprehensively covers both these ideas among the four options.

Hence, the correct answer is **option 1**.

28. The poet begins the poem with - "As you set out for Ithaca, hope the journey is a long one". The poet

further says, "Keep Ithaka always in your mind./Arriving there is what you are destined for."

Therefore, Ithaka is the destination. A reading of the poem will throw light on the fact that that Ithaka is an analogy for life's distant goal as mentioned in option 4. Options 1 and 2 can therefore be ruled out. The path to wisdom mentioned in option 3 is the journey and not Ithaka.

Hence, the correct answer is **option 4**.

29. In the poem, the author says, "Laistrygonians and Cyclops, angry Poseidon – don't be afraid of them: you'll never find things like that on your way" That eliminates options 1 and 4.

Yes, they are mythological characters as mentioned in option 2, but the poet has something more to say about them,- "Laistrygonians and Cyclops,/ wild Poseidon- you won't encounter them/ unless you bring them along inside your soul,/ unless your soul sets them up in front of you." This points out to personal obstacles that can be set up by the person itself. That leads us to option 3.

Hence, the correct answer is **option 3**.

30. The poet is not pleading in any way. And, he is definitely not consoling either. That eliminates options 3 and 4.

To prescribe is to recommend or advise and to exhort is to urge or encourage. More than doling out advice, the author is encouraging- "As you set out for Ithaka / hope the journey is a long one,/ full of adventure, full of discovery." Therefore, the best word out of these is 'exhort' or 'push' to undertake a meaningful journey.

Hence, the correct answer is **option 2**.

31. The subject, 'running of a large business' or 'running of large businesses' is singular and should take a singular verb (consists) and not plural (consist). With that, options 1 and 4 can be ruled out.

In C, it should be 'more than its cost.' Option 3 can therefore be eliminated.

Statement B is correct in this regard ('more than it costs' is correct).

Hence, the correct answer is **option 2**.

32. Look at the sentences carefully and go about this question by eliminating the incorrect sentences. Only in sentence B, the sentence talks about 'found in the sixteenth century', whereas the other sentences speak about 'from the sixteenth century onwards.' Therefore, option 2 can be eliminated as the meaning changes.

Sentence A can be eliminated as it should be 'about their bodies and its products. With 'their' the word 'body' should also be used in its plural form.

Disdain is not to be used with 'about' as mentioned in sentence D. It should be 'disdain for' in place of 'disdain about' and therefore, option 4 can be ruled out as well.

Sentence C is the most appropriate.

Hence, the correct answer is **option 3**.

33. Avoid the continuous form- falling in option 2 if you have a better option. So, we eliminate option 2.

'Fall back to' is incorrect usage. The phrase should be 'fall back on'. With that option 4 can also be eliminated. The sentence suggests that there is one explanation of irrational events. Therefore, we can eliminate option 3 because it uses the plural word explanations.

Hence, the correct answer is **option 1**.

34. The word regarded modifies both 'valuable in itself' and 'service to the nation'. Therefore, 'regarded should be placed before 'not only' and not after or in between as in sentences B and C. Thus, options 2 and 3 are ruled out.

Between sentences A and D, sentence A can be ruled out as it is not 'valuable for itself', the correct usage is 'valuable in itself'.

Hence, the correct answer is **option 4**.

35. Here's a question which gives sentences where there is no blatant grammatical error. Instead you are asked to choose the best sentence.

Sentence D differs in meaning from the other sentences and should be eliminated.

Sentence C uses passive voice (there is a preference for active voice in English language) and can be ruled out as well.

Between A and B, sentence A is more verbose or wordy. A also has a parallelism error, "it would be ideal for humans" to 'it would have been ideal for humans'.

Hence, the correct answer is **option 2**.

36. DB and CE are mandatory pairs. In D, the author sends emails and B mentions when he gets replies.

Statement C ends with the senior stating that she studies in her sleep. Statement E continues the same by explaining how she manages to study like that. CE is present in options 1, 2 and 3. Therefore, option 4 can be eliminated.

However, if you figured out DB, you have arrived at the answer right away.

Statement A begins the paragraph. It introduces the author's intention of getting to know Princeton university students.

DBCE are extensions of what happens at the university. Hence, the correct answer is **option 3**.

37. Pay attention to the sequence of events. All options start with C where there is a reference to early June. A should follow that ("four days later") with regards to time reference. That eliminates option 3.

BD is a pair - statement B introduces Craig Conway and D continues with what Mr. Conway had to say ('moreover' is a link word). That narrows down our choices to options 1 and 4. Statement B mentions Conway's plans being endangered (possibly with his wanting to buy J.D. Edwards and instead Oracle approaching his company). The statement gives a reason for the decision mentioned in E, that of turning down Oracle. Therefore, statement E comes last.

Hence, the correct answer is **option 1**.

38. E explains why "war against terror" is a misnomer given in statement C. Therefore, CE is a pair and E does not begin the paragraph. Options 1, 2 and 3 can be ruled out.

Statements E and B are linked by a common word- "phenomenon".

Another pair is DA- D talks about humanitarian content which is exemplified in A- combatants cannot be incarcerated in razor wire cages.

Hence, the correct answer is **option 4**.

39. Statement E begins the paragraph, because it is here that the author introduces his occupation of collecting animals and 'collecting' people and therefore would logically proceed to speak about his experiences with both people and animals. That eliminates options 2 and 4.

AC is a pair. Most people the author has met have been charming as mentioned in statement A and the reason for this has been cited in C.

Similarly, BD is a pair. B speaks of the 'unpleasant human animals' and D reasons out how these are rare and do not matter much to the author. The keyword 'then' in B indicates that statement B will come after AC. Therefore, the logical flow of the paragraph is E-A-C-B-D.

Hence, the correct answer is **option 1**.

40. Statement C begins the paragraph as it introduces the concept of the 'QUERTY' design.

E explains the mechanical problem spoken of in C and hence statement E continues immediately after statement C.

Statement A mentions how this problem was solved with the layout.

Statement B describes an alternate layout designed in 1936 and statement D gives the reason why it- the alternate layout- was not adopted. Thus, the logical sequence is CEABD.

Hence, the correct answer is **option 2**.

41. 'Bundle of joy' is common idiomatic expression used to mean 'a newborn baby' and it is correctly used in option 1.

In the second sentence, "bundle" is used a collective noun and indicates 'several' benefits.

Although sentence 3 may not be frequently seen, "bundle" is used correctly to mean 'a large sum of money'. Therefore, we are left with the fourth option where "bundle" is used as a collective noun but here it is incorrect as it is used to mean 'a group' of humans which is incorrect usage.

Hence, the correct answer is **option 4**.

42. A more appropriate word for option 1 is 'clear' in place of "distinct". The awkwardness is evident when you read out the sentence. For example, we don't say that, 'it is distinct that option 1 is inaccurate'.

In option 2 "distinct" has been used in its usual sense, to mean, "readily distinguishable from others" and the sentence is correct.

In option 3, "distinct" means, "easily perceived by the senses or the intellect" and has been correctly used.

In the fourth sentence, "distinct" again means 'distinguishable from others' and the sentence is correct.

Hence, the correct answer is **option 1**.

43. When used in the legal sense, "implicate" means 'to involve or connect intimately or incriminatingly' (cause to look guilty). This meaning applies to the second sentence and the word is appropriate for the sentence.

Another meaning of "implicate" is 'to imply or entail', and, it has been used in this sense in option 3. In option 4 as well, it means, 'imply' or 'convey' and the word has been used correctly in the sentence.

In option 1, "implication" is not the word to be used. People appreciated the headmaster's initiative or good work or efforts.

Hence, the correct answer is **option 1**.

44. "Host" in the first sentence is used to mean 'someone who entertains or receives guests'.

In sentence 2, "host" means 'a place where organisms / animals live'. It can also mean that there are a multitude of snakes (or there is a variety in range of

snakes) in Kerala's forests. In both these options, the word "host" has been correctly used.

In option 3, it should be 'play host to' in place of 'play the host to'. The 'the' after the word 'play' makes it awkward as it is not used with the article.

In option 4, "host" means a place where an organism lives and here it has been used correctly.

Hence, the correct answer is **option 3**.

45. In options 1 and 3, "sort" is synonymous in meaning to the word 'a kind (category)' or 'a type'. "Sort" is used to mean 'classify' in option 4. In all these options, "sort" has been correctly used.

In option 2, "sort" means 'character' or 'nature' or 'a kind'. It should be 'all sorts' since the subject farmers' is plural, it should be followed by plural 'sorts'.

Hence, the correct answer is **option 2**.

46. Option 1 can be eliminated as M&S would not be interested in acquiring something which is its own!

The second word 'auction' also does not fit the idea that well, as the operative word here is 'sell'. M&S was trying to sell King's. Also, people do not 'ratify' defeat. Therefore, option 4 can also be eliminated.

'Dispose' in option 3 is used along with the preposition 'of' - "He disposed of the problem quickly." Therefore, option 3 can be eliminated as well.

Moreover, 'conceding' defeat sounds fine (which means agreeing that one has been defeated). 'Offload' here means 'relieve of' and is correct for the second blank.

Hence, the correct answer is **option 2**.

47. The clue lies in the second part of the sentence. Tendency to develop friendships outside college "masks" or hides signals of maladjustment means there is an off-putting or unhelpful influence. Therefore, the second blank cannot have 'facilitated' (option 2) or 'helped' (option 4).

Option 3 is appropriate here. Early 'identification' of maladjustment in college is 'complicated' by people developing friendships outside the college.

In option 1, although the second word makes sense, the first word 'treatment' does not go with 'compounded'. The 'identification' or detection of maladjustment can become 'complicated' or 'compounded' but not the 'treatment'.

Hence, the correct answer is **option 3**.

48. A difficult question, perhaps because they (the paper setters) have given you synonyms of 'different' in all options. (in earlier CAT papers you had choices!). For the first blank, the operative word is 'different'. The

regions have unique cultures and therefore they are different (unlike in form, quality, amount or nature).

'Divergent', you may be able to eliminate, because primarily it means 'drawing apart from a common point' and nothing in the sentence suggests that. So, let us eliminate option 3.

For the second blank, 'competing' does not fit that well. Competition is generally there for some advantage or a goal. The sentence does not suggest that either and therefore, we can do away with option 4.

Options 1 and 2 are very close, so instead of incorrect we would simply look at a more appropriate answer. We will go with option 1 because 'different' seems the best word for the first blank. Also, 'disparate' (option 2, word for the second blank) is slightly stretched for the sentence. 'Disparate' means 'fundamentally distinct or different in kind; entirely dissimilar' (too much!) and 'containing or composed of dissimilar or opposing elements'. That is a bit extreme for a country.

Hence, the correct answer is **option 1**.

49. If the students end up 'replacing' the original teachers who are finally left with less-paying jobs or no jobs, the professionals are definitely not going to appreciate that or welcome that trend. Therefore, option 3 is eliminated.

Option 4 uses a neutral 'are' for the first blank, whereas the latter part of the sentence indicates that there should be a feeling of resentment or bitterness among those professional experts whose jobs are taken away from them or who have to be content with lower pay. Therefore, we can do away with option 4 as well.

Between options 1 and 2, option 1 is the best contender. 'Resent' is better than 'resist', as the sentence does not imply that these professionals 'resist' or are opposed to the training of foreigners, just that they dislike getting a raw deal in the end.

Hence, the correct answer is **option 1**.

50. If the companies are 'giving' (option 1), 'bestowing' (option 2) or 'conferring' (option 3) rewards why would that encourage negative kinds of behaviour?

Option 4 makes more sense. If the companies 'withhold' rewards, they are unable to 'foster' or promote a genuine interest in doing the work well.

Hence, the correct answer is **option 4**.

51. For statement A:

$$\begin{aligned} \text{Success rate for males in 2003} &= \frac{637}{60133} \times 100 \\ &= 1.06\% \end{aligned}$$

$$\text{Success rate for females in 2003} = \frac{399}{40763} \times 100$$

$$= 0.98\%$$

∴ Statement A is false.

**For Statement B:**

$$\text{Success rate for females in 2002} = \frac{138}{15389} \times 100$$

$$= 0.90\%$$

$$\text{Success rate for females in 2003} = \frac{399}{40763} \times 100$$

$$= 0.98\%$$

∴ Statement B is also false.

Hence, **option 4**.

**52. For statement A:**

$$\text{Required proportion of females} = \frac{48}{19236} = 0.25$$

$$\text{Required proportion of males} = \frac{171}{61205} = 0.28$$

∴ Statement A is false.

**For Statement B:**

$$\text{Success rate for males} = \frac{171}{684} \times 100 = 25\%$$

$$\text{Success rate for females} = \frac{48}{138} \times 100 = 34.78\%$$

∴ Statement B is also false.

Hence, **option 4**.

**53. For statement A:**

$$\text{Required percentage for females in 2002}$$

$$= \frac{3847}{19326} \times 100 \approx 20\%$$

$$\text{Required percentage for females in 2003}$$

$$= \frac{4529}{45292} \times 100 \approx 10\%$$

∴ Statement A is true.

**For statement B:**

$$\text{Required percentage for males} = \frac{3165}{63298} \times 100 \approx 5\%$$

$$\text{Required percentage for females in 2003}$$

$$= \frac{4529}{4529} \times 100 \approx 10\%$$

∴ Statement B is false.

Hence, **option 1**.

**54.** It starts to decline after the 3<sup>rd</sup> month because the slope of the line depicting her development starts to decrease after the 3<sup>rd</sup> month.

Hence, **option 2**.

**55.** Geeta grew at the fastest rate because her development line has the maximum slope.

Hence, **option 1**.

**56.** Rate of growth during the third month was the lowest in case of Geeta because the slope of her development line is negative while it is positive for the 2<sup>nd</sup> month.

Hence, **option 1**.

**57.** Taking approximate values for the growth rates of the infants we get:

$$\text{Growth of Seeta in first five months} = 58 - 50 = 8$$

$$\text{Growth of Geeta in first five months} = 62 - 49 = 13$$

$$\text{Growth of Ram in first five months} = 63 - 52 = 11$$

$$\text{Growth of Shyam in first five months} = 63 - 54 = 9$$

Though the growth of Seeta and Shyam is approximately the same but looking at the graph we can see that growth of Seeta is less as compared to Shyam.

Hence, **option 2**.

**58.** Males with their ages = 38, 32, 21, 32, 33

Females with their ages = 34, 35, 27, 37

∴ Minimum number of respondents aged less than 40 = 5 males + 4 females = 9

$$\text{∴ Required percentage} = \frac{9}{30} \times 100 = 30\%$$

Hence, **option 4**.

**59.** Maximum number of respondents older than 35 = Total ( Minimum number of respondents aged 35 or below

$$= 30 ( (4 \text{ males} + 3 \text{ females})$$

$$= 23$$

$$\text{∴ Required percentage} = \frac{23}{30} \times 100 = 76.67\%$$

Hence, **option 3**.

**60.** Percentage of respondents in 35-40 years age group is at least

= 1 male (38, 38) with no children + 1 female with 1 child + 1 female with 2 children + 1 female with 3 children

$$= 4$$

$$\text{∴ Required percentage} = \frac{4}{30} \times 100 = 13.33\%$$

Hence, **option 3**.



61. The category in which the percentage of spam emails is increasing but at a decreasing rate is Products.

	Sep 2002	Dec 2002	March 2003	June 2003
Product	3	7	10	11
Percentage increase	-	$\frac{4}{3} \times 100$ = 133.33%	$\frac{3}{7} \times 100$ = 42.86%	$\frac{1}{10} \times 100$ = 10%

Hence, **option 3**.

62.  $\therefore$  Total number of emails in Dec 2002 > Total number of emails in June 2003  
 $\therefore$  19% of the total number of emails in Dec 2002 is greater than 18% of the total number of emails in June 2003.  
 $\therefore$  The total number of spam emails in the health category was larger in December 2002 as compared to June 2003.  
Hence, **option 1**.
63. It cannot be determined because though the percentage of spam emails in financial category is lower in case of September 2002 as compared to March 2003 but the total number of spam emails in September 2002 was higher as compared to March 2003.  
 $\therefore$  We cannot say that for which month and year out of these two, the number of spam emails in financial category was larger or smaller.  
Hence, **option 4**.
64. The total amount mobilized falls short of the amount notified only once on 17 July-02 for the first round, where the total amount mobilized was Rs. 16 crores and the notified amount was Rs. 40 crores.  
Hence, **option 2**.
65. The second round issue has lower maturity on 17 July-02, 09 April-03 and 04 June-03.  
Of this on 04 June-03, the second round received higher competitive bids at 378 as compared to 187 in the first round.  
Hence, **option 3**.
66. All the statements except option 4 are true. The value of non-competitive bids accepted in the first round is always greater than that in the second round except on 7-Nov-2002, 5-May-2003 and 2-Jul-2003.  
Hence, **option 4**.
67. Draw a line from the bottom left corner to the top right corner of the graph. The symbols lying above the line

are the ones in which the profits exceeds 10% of the turnover.

$\therefore$  The equation of this line is Profit = 0.10  $\times$  turnover  
There were 2 Textile companies, 2 Cement companies and 3 Steel companies for which the profits exceeded 10% of turnover.

$\therefore$  For 7 companies the profits exceeded 10% of turnover.

Hence, **option 2**.

68. There were two steel companies with turnover more than 2000 and profits less than 300.  
Hence, **option 3**.
69. Out of the seven companies which lie above the line represented by the equation as solved in the first question, two are textile companies.  
 $\therefore$  5 choices are available to the investor.  
Hence, **option 2**.
70. She should not select University of Virginia because its median salary is less than \$70,000.  
She should not select University of Pennsylvania because its tuition fee exceeds \$23,000.  
She should not select Northwestern University because its tuition fee exceeds \$23,000.  
 $\therefore$  She should select University of California-Berkeley (Annual tuition fee is \$18,788 and Median starting salary is \$70,000).  
Hence, **option 4**.
71. There were two schools which satisfied this criterion. Stanford University (median starting salary = \$82,000 and annual tuition fee = \$23,100)  
New York University (median starting salary = \$70,583 and annual tuition fee = \$23,554)  
Hence, **option 2**.
72. There were eight schools which satisfied this criterion. These were first nine schools except Dartmouth College.  
Hence, **option 4**.
73. Number of children of age 9 years or less = 48  
Number of children having height of 135 cm or less = 45  
 $\therefore$  The table given is a cumulative frequency table.  
 $\therefore$  The lower value is the answer.  
 $\therefore$  45 is the number of children satisfying both the conditions.  
Hence, **option 2**.

74.

	Number of children
Age > 10 years	$100 - 60 = 40$
Height > 150 cm	$100 - 75 = 25$
Weight > 48 kg	$100 - 91 = 9$

∴ The number of children who are above 10 years and taller than 150 cm is 25.

Out of these 25 children, 9 weigh above 48 kg.

∴ Required number of children =  $25 - 9 = 16$

Hence, **option 1**.

75. Number of students up to age 12 = 77

Number of students up to weight 38 kg = 33

∴ Number of children weighing more than 38 kg but not older than 12 years

$$= 77 - 33$$

$$= 44$$

Hence, **option 3**.

76. It can be observed that the profit value of D is relatively more and the sales value of D is relatively less.

$$\text{Probability of A} \approx \frac{5}{25} = 20\%$$

$$\text{Probability of B} \approx \frac{4}{25} = 16\%$$

$$\text{Probability of C} \approx \frac{4.8}{24} = 20\%$$

$$\text{Probability of D} \approx \frac{4}{16} = 25\%$$

Hence, **option 4**.

77. Total sales of A and B combined together would be approximately Rs. 50,000

$$\therefore \text{Required percentage} = \frac{50000}{90000} \times 100 \approx 55\%$$

Hence, **option 1**.

78. Let's try to organize the given information.

Lawyer (male)	Housewife (female)
A	D

Accountant (male)	Professor (female)
C	F

E is not a housewife.

∴ B is a housewife and E is an engineer because there are two housewives in the group.

∴ No woman in the group is an engineer or accountant.

∴ E is a male.

A and D are one of the married couples.

Hence, **option 4**.

79. E is an engineer.

Hence, **option 1**.

80. A, C and E are males.

Hence, **option 2**.

81. The best method here is to eliminate the options on the basis of given information.

Option 1 cannot be the answer as C gets Defence.

Option 3 cannot be the answer as F cannot be with D.

Option 4 cannot be the answer as C gets Telecom.

Option 2 is a valid assignment as it satisfies all the given conditions.

Hence, **option 2**.

82. If D gets Telecom then B must get Power.

∴ Option 4 is not a valid assignment.

Hence, **option 4**.

83. AVOCADO paint would cost minimum when its constituents have the minimum possible price.

AVOCADO is made by mixing equal 'ORANGE' and 'PINK'.

∴ We have the following possibilities:

Colour	Possible Combinations	Total cost (in. Rs.)	Litres	Cost/Litres (in. Rs.)
AVOCADO	ORANGE + PINK	$22 + 18 = 40$	2	20
	(RED + YELLOW) + PINK	$\left(\frac{20 + 25}{2}\right) + 18 = 40.5$	2	20.25
	ORANGE + (RED + WHITE)	$22 + \left(\frac{20 + 15}{2}\right) = 39.5$	2	19.75
	(RED + YELLOW) + (RED + WHITE)	$\left(\frac{20 + 25}{2}\right) + \left(\frac{20 + 15}{2}\right) = 40$	2	20

From the table we have the minimum cost as Rs. 19.75 per litre.

Hence, **option 2**.

84. The possible combinations for WASHEDORANGE are given below:

Combination	Ratio
ORANGE + WHITE	1:1
(RED + YELLOW) + WHITE	1:1:2

Hence, **option 4**.

85. From the solution to the first question of the set we know that the least possible price for AVOCADO is Rs. 19.75.

The least possible price for CREAM is when WHITE and YELLOW is mixed in the ratio 7 : 3

$$= \frac{7 \times 15 + 3 \times 25}{10} = \text{Rs. } 18$$

The least possible price for WASHEDORANGE is when ORANGE and WHITE is mixed in the ratio 1 : 1

$$= \frac{15 + 22}{2} = \text{Rs. } 18.5$$

∴ Profitability is the maximum for CREAM.

Hence, **option 2**.

86. B is seated at the centre seat no. 4.  
A and G can be seated on either seats 6 or 7.  
∴ C and D have to sit as far as possible  
∴ They can occupy seats 1 and 5.  
∴ We have the following possible arrangements.

D/C	E/F	F/E	B	C/D	A/G	G/A
1	2	3	4	5	6	7

Out of the given options, we know that F cannot be seated at either end.

Hence, **option 3**.

87. E always occupies either position 2 or position 3 and A always occupies either position 6 or position 7.

∴ E and A can never sit together.

Hence, **option 4**.

88. G can never sit beside B.

Hence, **option 3**.

89. F and M have a total of four brothers and three sisters. Statement A states that F has two brothers, which means M should have two brothers.

∴ Statement A is alone sufficient.

Statement B is redundant as no additional information is provided.

Hence, **option 1**.

90. Let the number of tosses be  $x$ .

$$\begin{aligned} \text{Total amount spent by Ram after } x \text{ tosses} &= (10 + x \times 1) \\ &= \text{Rs. } (10 + x) \end{aligned}$$

We know that Ram incurs a loss of Rs. 50.

∴ We have two cases to evaluate:

If the game ends normally then Ram's net loss = Rs.  $(10 + x) - \text{Rs. } 100$

If he quits prematurely his loss = Rs.  $(10 + x)$

From statement A,

Ram's net loss =  $(10 + x) - 100$

$$\therefore 50 = (10 + x) - 100$$

$$\therefore x = 140$$

∴ Statement A is alone sufficient.

From statement B, we do not get any useful information.

∴ Statement B is not sufficient.

Hence, **option 1**.

91. From Statement A,

$$\text{Number of soaps purchased by Ms. X} = \frac{210}{10} = 21$$

Also the last label obtained by her is S.

But this is not sufficient to get the number of P's.

∴ Statement A alone is not sufficient.

From Statement B,

The number of O's and A's is 18.

But this is also not individually sufficient to arrive at the required answer.

∴ Statement B alone is not sufficient.

After combining both the statements A and B, we can conclude that 18 out of 21 coupons are O's and A's and that the 21<sup>st</sup> is an S.

∴ This means that the remaining two are P's.

Hence, **option 3**.

92. From the question, if A and C participate in a race, A will win by 90 seconds.

From statement A,

∴ A beats C by 375 m or 90 sec.

$$\therefore C's \text{ speed} = \frac{375 \text{ m}}{90 \text{ s}}$$

But the length of the track is not known.

∴ Statement A is not sufficient to find the time taken by C to complete the race.

From Statement B we cannot find the speed of C.

∴ Statement B alone is not sufficient.

After combining both the statements A and B, the time taken by C to complete the race

$$= \frac{\text{Length of the track}}{C's \text{ speed}} = \frac{1000}{\left(\frac{375}{90}\right)} = 240 \text{ sec}$$

Hence, **option 3**.

93. Dhanraj = 19 and Jugraj = 27

∴ Dhanraj + Jugraj = 46

∴ Option 1 is true.

Hence, **option 1**.

94. From the given information following equations can be formed:

Ashish - Ganesh = 8 ... (i)

Dhanraj + Ramesh = 37 ... (ii)

Jugraj - Dhanraj = 8 ... (iii)

Ashish - Dhanraj = 5 ... (iv)

Ashish + Ganesh = 40 ... (v)

Adding equations (i) and (v), we get,

$2 \times \text{Ashish} = 48$

∴ Ashish = 24

∴ Ganesh = 16

∴ Dhanraj = 19, Jugraj = 27 and Ramesh = 18

Dhanraj shot 19 baskets and Ramesh shot 18 baskets.

∴ Option 1 is true.

Hence, **option 1**.

95. The amounts are Rs. 2,234, Rs. 1,193, Rs. 1,340 and Rs. 2,517. The fifth amount is not given.

∴ One woman's amount = Chellamma's amount + Rs. 1,378

∴ All the women spent more than Rs. 1,000.

∴ Chellamma's amount

= Rs. 2,517 - Rs. 1,378

= Rs. 1,139

∴ The biggest amount of Rs. 2,517 is spent by Shahnaz.

∴ It is given that Helen spent more than Dhenuka and Dhenuka did not spend Rs. 1,340.

∴ Dhenuka spent Rs. 1,193.

We also know that the women who spent Rs. 2,234 arrived before the lady who spent 1193.

∴ Archana spent Rs. 2,234 and Helen spent Rs. 1,340.

	Amount Spent	
Archana	Rs. 2,234	Not Rs. 2,517
Chellamma	Rs. 1,139	
Dhenuka	Rs. 1,193	Not Rs. 1,340
Helen	Rs. 1,340	
Shahnaz	Rs. 2,517	

The amount spent by Helen was Rs. 1,340.

Hence, **option 2**.

96. Rs. 1,139 was one of the amounts spent. It was spent by Chellamma.

Hence, **option 1**.

97. The woman who spent Rs. 1,193 was Dhenuka.

Hence, **option 3**.

98. From (i),

Number of vadas eaten by Ignesh is 6 and the person eating 4 idlis eats 2 vadas.

From (vii),

Number of vadas eaten by Bimal = 4

Number of idlis eaten by Bimal = 8

Number of idlis eaten by Ignesh = 6

Ignesh, Mukesh, Daljit and Bimal eat at least 1 vada and 1 idli.

∴ Sandeep doesn't eat any vadas but eats 1 idli.

From (vi),

Number of vadas eaten by Mukesh = 2

Number of idlis eaten by Mukesh = 4

	Vadas	Idlis	Chutney
Ignesh	6	6	Yes
Mukesh	2	4	No
Sandeep	0	1	No
Daljit	1	5	Yes
Bimal	4	8	No

Daljit eats 5 idlis.

Hence, **option 1**.

99. Ignesh eats 6 vadas and Bimal eats 4 vadas.

There seems to be some problem with this question as there are two options which are correct.

Hence, **option 3** or **option 4**.

100. Ignesh eats 6 vadas and 6 idlis with chutney.

Hence, **option 3**.

101. Price of 1<sup>st</sup> bottle = 520 Bahts

Price of 2<sup>nd</sup> and 3<sup>rd</sup> bottles each =  $(520 \times 0.7)$

= 364 Bahts

∴ Total cost of all three bottles = 1248 Bahts

Cost per person = 416 Bahts

R pays 2 Euros =  $2 \times 46 = 92$  Bahts

M pays 4 Euros and 27 Bahts =  $4 \times 46 + 27 = 211$  Bahts

S pays the remaining amount =  $1248 - (92 + 211)$

= 945 Bahts

∴ R owes  $416 - 92 = 324$  Bahts to S.

Hence, **option 4**.

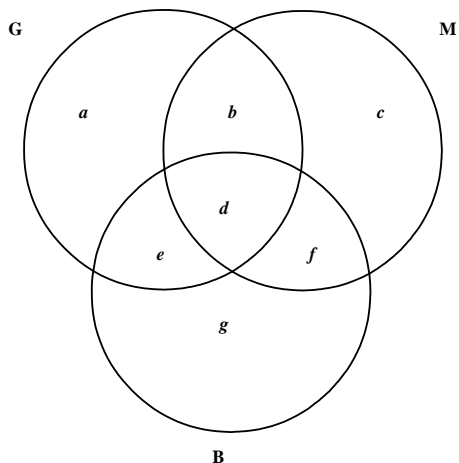
102. From the solution to the previous question,

M owes =  $416 - 211 = 205$  Bahts to S

But,  $205 \text{ Bahts} = 205/41 = 5 \text{ US Dollars}$

Hence, **option 3**.

103.



Let  $a$  be the number of projects in which only Gyani is involved,  $g$  be the number of projects in which only Buddhi is involved and  $c$  be the number of projects in which only Medha is involved.

From the data,  $d = 6$

$$b + d = 14$$

$$\therefore b = 8$$

Also,  $e = 3$  and  $f = 2$

It is given that

$$a + g = b + c + d + f$$

$$\therefore a - c + g = 16 \quad \dots (i)$$

Number of projects involving more than 1 consultant

$$= 6 + 8 + 2 + 3 = 19$$

$$\therefore \text{Total number of projects} = 2 \times 19 - 1 = 37$$

$$a + b + c + d + e + f + g = 2 \times (b + d + e + f) - 1$$

$$\therefore a + c + g = 19 - 1 = 18 \quad \dots (ii)$$

Solving (i) and (ii), we get,

$$c = 1 \text{ and } a + g = 17$$

$\therefore a$  cannot be determined uniquely.

Hence, **option 4**.

104. From the solution to the previous question, we get,

$$c = 1$$

$\therefore$  Number of projects in which Medha alone is involved = 1

Hence, **option 2**.

105.  $2^x - x - 1 = 0$

$$\therefore 2^x = x + 1$$

This equation indicates the intersection of an exponential curve, lying in the I and II quadrants, and a straight line.

$\therefore$  It can have two intersection points at the most.

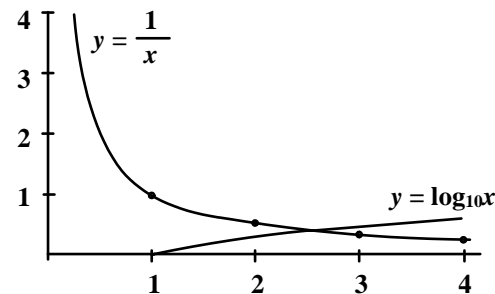
In this case, we can find two intersection points by trial and error as  $x = 0$  and  $x = 1$

$\therefore$  There cannot be any other point of intersection.

$\therefore$  The equation has 2 non-negative real roots.

Hence, **option 3**.

106.



As shown in the above figure, the graphs for,  $y = 1/x$  and  $y = \log_{10} x$  intersect at only one point.

Hence, **option 2**.

Alternatively,

To find the point of intersection, we just equate these two functions.

$$1/x = \log_{10} x$$

Putting  $y = 1/x$ , we get,

$$10^y = 1/y$$

Here, RHS (i.e.  $1/y$ ) cannot be negative as LHS. ( $10^y$ ) cannot be negative.

For  $y = 0$ , LHS < RHS

for  $y = 1$ , LHS > RHS

From this we understand that these two functions intersect each other at least once.

But,  $10^y$  is an increasing function and  $1/y$  is a decreasing function.

$\therefore$  They intersect each other at a single point only.

Hence, **option 2**.

107. Ratio of areas of two spheres =  $s_1 : s_2 = 4 : 1$

$$\therefore \text{Ratio of their radii} = r_1 : r_2 = 2 : 1$$

$$\therefore \text{Ratio of their volumes} = v_1 : v_2 = 8 : 1$$

Volume of A is 12.5% ( $1/8^{\text{th}}$ ) of the volume of B.

But, volume of A is  $k\%$  less than B.

$$\therefore k = (100 - 12.5) = 87.5\%$$

Hence, **option 4**.

108. On substituting the values of  $p$ ,  $q$  and  $r$  in the options we see that the values of  $p$ ,  $q$  and  $r$  satisfy only the equation  $5p - 2q - r = 0$ .

Hence, **option 1**.

Alternatively,

In order to understand this solution we need to have an understanding of a few concepts of higher mathematics like "Rank of a matrix".

A number  $p$  is said to be the rank of a matrix  $A$  if

(i)  $A$  possesses at least one  $p$ -rowed determinant whose value is not zero

(ii)  $A$  does not possess any non zero  $(p + 1)$  rowed determinant.

In other words, the number of non-zero rows in the row-reduced form of a matrix is called the rank of a matrix.

For example,

Consider the matrix,

$$A = \begin{pmatrix} 4 & 5 & 6 \\ 1 & 2 & 3 \\ 3 & 4 & 5 \end{pmatrix}$$

Matrix  $A$  has only one 3 rowed determinant, namely

$$\begin{vmatrix} 4 & 5 & 6 \\ 1 & 2 & 3 \\ 3 & 4 & 5 \end{vmatrix}$$

The value of this determinant is zero. Hence, the rank of  $A$  will be less than 3.

Now we will try to find a 2 rowed non zero determinant.

$$\begin{vmatrix} 4 & 5 \\ 1 & 2 \end{vmatrix} = 4 \cdot 2 - 5 \cdot 1 = 3 \neq 0$$

The fact that every 3 rowed determinant of  $A$  is zero and there is at least one 2 rowed determinant of  $A$  which is not zero, is generally expressed by saying that the rank of  $A$  is 2.

Consider the system of equations,

$$x + 2y - 3z = p$$

$$2x + 6y - 11z = q$$

$$x - 2y + 7z = r$$

The coefficient matrix (whose elements are coefficients of the three unknowns  $x, y$  and  $z$ ) of the system is

$$\begin{pmatrix} 1 & 2 & -3 \\ 2 & 6 & -11 \\ 1 & -2 & 7 \end{pmatrix}$$

And the Augmented matrix is

$$\begin{pmatrix} 1 & 2 & -3 & p \\ 2 & 6 & -11 & q \\ 1 & -2 & 7 & r \end{pmatrix}$$

For the system of equations to possess solutions it is necessary that the rank of the augmented matrix and the rank of the coefficient matrix should be equal.

Let us first find the rank of the coefficient matrix.

We will first find the value of the only 3 rowed determinant of  $A$ ,

$$\begin{vmatrix} 1 & 2 & -3 \\ 2 & 6 & -11 \\ 1 & -2 & 7 \end{vmatrix}$$

$$= 1(6 \times 7 - 11(-2)) - 2(2 \times 7 - (-11)1) - 3(2 \times (-2) - 6 \times 1) = 0$$

Hence, the rank of the coefficient matrix will be less than 3.

The following is a two-rowed non-zero determinant in the coefficient matrix

$$\begin{vmatrix} 1 & 2 \\ 2 & 6 \end{vmatrix} = 6 - 4 = 2 \neq 0$$

Hence, the rank of the coefficient matrix is 2.

For the system of equations to possess solutions the rank of the augmented matrix should also be 2.

We will first try to simplify the augmented matrix using row operations.

$$\begin{pmatrix} 1 & 2 & -3 & p \\ 2 & 6 & -11 & q \\ 1 & -2 & 7 & r \end{pmatrix}$$

By the Row operation  $R_3 \rightarrow R_3 - R_1$

we reduce the augmented matrix to the equivalent matrix,

$$\sim \begin{pmatrix} 1 & 2 & -3 & p \\ 2 & 6 & -11 & q \\ 0 & -4 & 10 & r - p \end{pmatrix}$$

(By the Row operation  $R_2 \rightarrow R_2 - 2R_1$ )

$$\sim \begin{pmatrix} 1 & 2 & -3 & p \\ 0 & 2 & -5 & q - 2p \\ 0 & -4 & 10 & r - p \end{pmatrix}$$

(By the Row operation  $R_3 \rightarrow R_3 + 2R_2$ )

$$\sim \begin{pmatrix} 1 & 2 & -3 & p \\ 0 & 2 & -5 & q - 2p \\ 0 & 0 & 0 & -5p + 2q + r \end{pmatrix}$$

For the augmented matrix to have rank 2 every 3 rowed determinant should be zero.

Hence,

$$5p - 2q - r = 0$$

Hence, **option 1**.

**109.** Total time available is 700 hrs on machine A and 1250 hrs on machine B.

Let the number of Standard Bags be  $s$  and the number of Deluxe Bags be  $d$ .

Here we have to maximize the profit margin i.e.  $20s + 30d$ , subject to the constraints,

$$4s + 5d \leq 700 \text{ and } 6s + 10d \leq 1250$$

Now consider options.

$$1. s = 75 \text{ and } d = 80$$

$$\therefore \text{The profit} = 75 \times 20 + 30 \times 80 = 3900$$

$$4s + 5d = 700 \text{ and } 6s + 10d = 1250$$

∴ the constraints are satisfied.

$$2. s = 100 \text{ and } d = 60$$

$$\therefore \text{The profit} = 100 \times 20 + 60 \times 30 = 3800$$

The profit is less than in option 1.

∴ Option 2 is not the answer.

$$3. s = 50 \text{ and } d = 100$$

$$\therefore \text{The profit} = 50 \times 20 + 100 \times 30 = 4000$$

$$4s + 5d = 700 \text{ and } 6s + 10d = 1300$$

∴ The second constraint is not satisfied.

∴ Option 3 cannot be the answer.

$$4. s = 60 \text{ and } d = 90$$

$$\therefore \text{The profit} = 60 \times 20 + 90 \times 30 = 3900$$

$$4s + 5d = 690 \text{ and } 6s + 10d = 1260$$

∴ The second constraint is not satisfied.

∴ Option 4 cannot be the answer.

As only option 1 satisfies the constraints and also maximizes the profit, option 1 is the answer.

Hence, **option 1**.

**110.** Assume that the first term of the progression is  $a$  and the common difference is  $d$ .

$$\therefore T_3 + T_{15} = T_6 + T_{11} + T_{13}$$

$$\therefore (a + 2d) + (a + 14d) = (a + 5d) + (a + 10d) + (a + 12d)$$

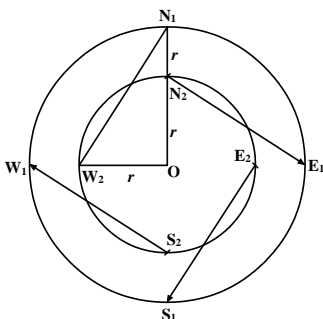
$$\therefore a + 11d = 0$$

$$\text{But, } T_{12} = a + 11d$$

∴ The 12<sup>th</sup> term of an arithmetic progression is 0.

Hence, **option 3**.

**111.** Consider the diagram below as per the conditions given in the question,



Speed on outer ring road =  $30\pi$  km/hr

Speed on inner ring road =  $20\pi$  km/hr

And speed on chord roads =  $15\sqrt{5}$  km/hr

Let  $R$  and  $r$  be radii of the Outer Ring road and the Inner Ring road respectively.

∴ Outer Ring road is twice as long as Inner Ring road, we have,

$$\therefore 2\pi R = 2 \times (2\pi r)$$

$$\therefore R = 2r$$

∴ Length of inner ring road =  $2\pi r$  km and outer ring road =  $4\pi r$  km

In the figure above, in  $\Delta OW_2N_1$ ,

$$W_2N_1 = \sqrt{(2r)^2 + r^2} = \sqrt{5}r \text{ km}$$

∴ Length of the chord road =  $\sqrt{5}r$  km

∴ Ratio of the length of all chord roads to length of the

$$\text{outer ring road} = \frac{4\sqrt{5}r}{4\pi r} = \frac{\sqrt{5}}{\pi}$$

Hence, **option 3**.

**112.** Total distance to be travelled

$$= S_1 - E_1 \text{ arc of the Outer Ring road} + \text{Chord } E_1 - N_2$$

Given the speeds,

Total time required to travel from  $S_1$  to  $N_2$

$$\frac{\pi r}{30\pi} + \frac{\sqrt{5}r}{15\sqrt{5}} = \frac{90}{60}$$

$$\therefore r = 15 \text{ km}$$

∴ Radius of the Outer Ring road  $R = 2r = 30$  km

Hence, **option 3**.

**113.** Total distance to be travelled, chord  $N_1 - W_2 + W_2 - E_2$  arc of the Inner Ring road

Given the speeds,

Total time required to travel from  $N_1$  to  $E_2$

$$= \frac{\sqrt{5}r}{15\sqrt{5}} + \frac{\pi r}{20\pi}$$

$$= \frac{r}{15} + \frac{r}{20}$$

$$= \frac{35r}{300}$$

$$= \frac{35 \times 15}{300}$$

$$= \frac{7}{4} \text{ hours}$$

$$= 105 \text{ minutes}$$

Hence, **option 4**.

**114.** Let  $R$ ,  $W$  and  $N$  be the number of questions with right answers, questions with wrong answers and not attempted questions respectively.

From the conditions given in the question, we have,

$$R + W + N = 50 \quad \dots (i)$$

$$R - W/3 - N/6 = 32 \quad \dots (ii)$$

Solving equations (i) and (ii), we get,

$$7R - 242 = W$$

∴  $W$  will be minimum for  $R = 35$ , i.e.  $W = 3$

Hence, **option 3**.

**115.** Consider option 1: There may be a person in the party who is acquainted with all the twenty-six others and rest may have the same or different number of acquaintances.

Consider option 2: For all people to have a different number of acquaintances, the first person will have a maximum of 26 acquaintances, the second person will have 25 acquaintances and so on. Continuing in this manner, the last person will have 0 acquaintances, which is not possible.

Consider option 3: There may be a person in the party who has an odd number of acquaintances.

Consider option 4: It may happen that a group of three people are mutual acquaintances.

Hence, **option 2**.

**116.** We have,  $g(x) = \max(5 - x, x + 2)$

We have to find the smallest value of  $g(x)$ .

The lines  $y = 5 - x$  and  $y = x + 2$  intersect each other at the point (1.5, 3.5)

For  $x < 1.5$ ,  $5 - x > x + 2$  and  $5 - x > 3.5$

For  $x > 1.5$ ,  $x + 2 > 5 - x$  and  $x + 2 > 3.5$

$\therefore$  At any point other than  $x = 1.5$ , the value of  $g(x)$  is greater than 3.5

Thus the smallest possible value of  $g(x) = 3.5$  at  $x = 1.5$

Hence, **option 4**.

**117.**  $f(x) = |x - 2| + |2.5 - x| + |3.6 - x| = g(x) + |2.5 - x|$ , where  $g(x) = |x - 2| + |3.6 - x|$

When  $2 \leq x \leq 3.6$ ,  $g(x)$  attains a fixed value.

This happens as in this range  $|x - 2| = x - 2$  and  $|3.6 - x| = 3.6 - x$

$\therefore |x - 2| + |3.6 - x| = x - 2 + 3.6 - x = 1.6$

When  $x < 2$ ,  $x - 2 < 0$ ,  $|x - 2| > 0$

Also, as  $-x > -2$ ,  $3.6 - x > 3.6 - 2$

$\therefore 3.6 - x > 1.6$

$\therefore |x - 2| + |3.6 - x| > 1.6$

Similarly, when  $x > 3.6$ ,

$|3.6 - x| > 0$  and  $|x - 2| > 1.6$

$\therefore |x - 2| + |3.6 - x| > 1.6$

Thus we can say that  $g(x)$  has the minimum value in the range  $2 \leq x \leq 3.6$

As  $f(x) = g(x) + |2.5 - x|$ ,

$\therefore f(x)$  attains the minimum value when  $2 \leq x \leq 3.6$  and  $|2.5 - x|$  is minimum.

This happens when  $x = 2.5$

$\therefore f(x)$  attains minimum when  $x = 2.5$

Hence, **option 2**.

*Alternatively,*

$f(x) = |x - 2| + |2.5 - x| + |3.6 - x|$

Substituting the value of  $x$  from the given options in the function,

when  $x = 2.3$

$f(x) = 0.3 + 0.2 + 1.3 = 1.8$

when  $x = 2.5$

$f(x) = 0.5 + 0 + 1.1 = 1.6$

when  $x = 2.7$

$f(x) = 0.7 + 0.2 + 0.9 = 1.8$

Substituting any arbitrary real values of  $x$  in  $f(x)$ ,

when  $x = 2$

$f(x) = 0 + 0.5 + 1.6 = 2.1$

when  $x = 3$

$f(x) = 1 + 0.5 + 0.6 = 2.1$

For any other value of  $x$ ,  $f(x)$  will be greater than 1.6

Hence,  $f(x)$  is minimum when  $x = 2.5$

Hence, **option 2**.

**118.** Number of even integers satisfying inequality i.e.

$100 \leq n \leq 200 = 51$

Total even integers divisible by 7 = 112, 126, 140, 154, 168, 182, 196 = 7

Total even integers divisible by 9 = 108, 126, 144, 162, 180, 198 = 6

The number 126 is repeated in both the sets.

$\therefore$  Total number of positive even numbers between 100 and 200 which are either divisible by 7 or 9 = 7 + 6 - 1 = 12

$\therefore$  Total number of positive even numbers between 100 and 200 which are divisible neither by 7 nor by 9

= 51 - 12 = 39

Hence, **option 3**.

**119.** Of the four given options 63 and 75 are multiples of 3. Their remainder cannot be 1.

$\therefore$  The last digit cannot be 1. Thus, 63 and 75 are eliminated.

For the options 31 and 91, the remainder is 1. Thus, the last digit is 1.

$31 = (11111)_2 = (1011)_3 = (111)_5$

$91 = (1011011)_2 = (10101)_3 = (331)_5$

91 has 1 as the first digit in only 2 of the notations.

Hence, **option 4**.

**120.** Let the speed of the slowest runner be  $s$  m/min and the speed of the fastest runner be  $2s$  m/min.

Length of the race track = 1000 m and the two runners meet after 5 minutes.

$\therefore$  Relative speed =  $1000/5 = 200$  m/min

$\therefore 2s - s = 200$



∴  $s = 200$  m/min  
 ∴ The speed of the fastest runner =  $2s = 400$  m/min  
 ∴ The time taken by the fastest runner to complete the race =  $4000/400 = 10$  min  
 Hence, **option 3**.

Alternatively,

The slowest runner covers 500 m when the fastest runner covers 1000 m.

∴ The two meet at the starting point when the fastest runner covers 2000 m and the slowest runner covers 1000 m.

∴ The fastest runner runs 2000 m in 5 minutes.

∴ He runs 4000 m in 10 minutes.

Hence, **option 3**.

- 121.**  $a^{44} < b^{11}$   
 But,  $a = 2$   
 ∴  $a^{44} = 2^{44}$   
 ∴  $a^{44} = 16^{11}$

**Using statement A alone:**

$b$  is an even integer. It may be less than or greater than 16.

So, we cannot answer the question using statement A alone.

**Using statement B alone:**

$b$  is greater than 16.

∴  $b^{11} > 16^{11}$   
 ∴  $b^{11} > a^{44}$

So, we can answer the question using statement B alone.

Hence, **option 1**.

- 122.**  $4x^2 + bx + c = 0$  ... (i)  
 One root =  $-1/2$

**Using statement A alone:**

Second root is  $1/2$ .

Sum of the roots =  $-b/4 = (-1/2) + 1/2 = 0$

∴  $b = 0$

Also, product of the roots =  $c/4 = (-1/2) \times (1/2) = (-1/4)$

∴  $c = -1$

So, statement A alone is sufficient to answer the question.

**Using statement B alone:**

Ratio of  $c$  and  $b$  is 1.

∴  $b = c$

∴ Equation (i) becomes  $4x^2 + bx + b = 0$  ... (ii)

But one root =  $-1/2$

Substituting  $x = -1/2$  in the above equation (ii), we get,

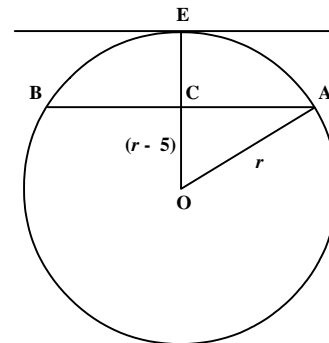
$1 - b/2 + b = 0$

∴  $b = -2$  and  $c = -2$

So, statement B alone is also sufficient to answer the question.

Hence, **option 2**.

**123.**



Let radius of circle be  $r$ .

$AC = 2.5$  as radius bisects the chord.

**Using statement A alone:**

We have been told that  $AB$  is not a diameter of the circle. But it does not give us any useful information to solve the problem.

So, statement A alone is not sufficient to answer the question.

**Using statement B alone:**

From the figure above,  $CE = 5$

∴  $OC = r - 5$

∴  $OA^2 = OC^2 + AC^2$

∴  $r^2 = (r - 5)^2 + (2.5)^2$

Solving the above equation,

$r = 3.125$  cm

So, statement B alone is sufficient to answer the question.

Hence, **option 1**.

- 124.** R. H. S. and L. H. S. are infinite GP's with common ratio  $\frac{1}{a^2}$   
 ∴ We need to find whether

$$\frac{\frac{1}{a^2}}{1 - \frac{1}{a^2}} > \frac{\frac{1}{a}}{1 - \frac{1}{a^2}}$$

∴  $\frac{1}{a^2} > \frac{1}{a}$

This statement (i) is always true for  $a < 1$ .

**Using statement A alone:**

It does not give any conclusion regarding value of  $a$  i.e. whether it is less than 1 or not.  
So, statement A alone is not sufficient to answer the question.

**Using statement B alone:**

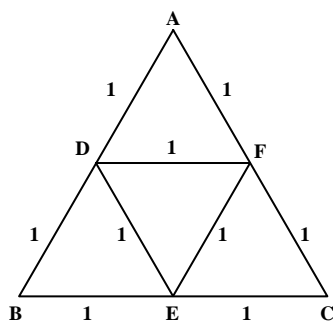
$$4a^2 - 4a + 1 = 0 \quad \dots(ii)$$

$$\therefore a = 1/2$$

So, statement B alone is sufficient to answer the question.

Hence, **option 1.**

125.



D, E and F are the midpoints of AB, BC and CA respectively.

**Using statement A alone:**

- $\therefore AD = 1$  cm
- $\therefore BD = 1$  cm                      ... (Since D is the mid-point)
- $\therefore DF = 1$  cm
- $\therefore BC = 2$  cm                      ... (Since D and F are the mid-points and DF is parallel to BC)
- $\therefore BE = 1$  cm and  $EC = 1$  cm
- $\therefore$  Perimeter of DEF = 3 cm
- $\therefore EF = 1$  cm
- $\therefore$  Area of  $\triangle DEF$  can be obtained.

So, statement A alone is sufficient to obtain the answer.

**Using statement B alone:**

- $\therefore$  Perimeter of  $\triangle ABC = 6$  cm,  $AB = 2$  cm,  $AC = 2$  cm
- $\therefore BC = 2$  cm
- $\therefore DE = 1$ ,  $EF = 1$  and  $DF = 1$

So, statement B alone is also sufficient to obtain the answer.

Hence, **option 2.**

126. Shepard bought 9 dozen goats at the end of 1998. Consider that he added 1 dozen goats to it, i.e. 11.11% of 9 dozen

And he sold 1 dozen to get back the same 9 dozen i.e. 10% of 10 dozen.

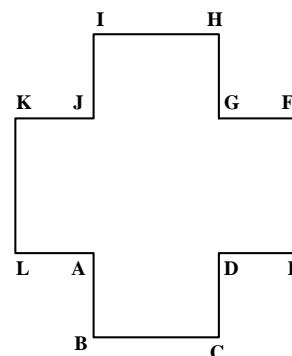
$\therefore$  He adds 11.11% and subtracts 10% to get the same amount every time.

$$\therefore p = 11.11\% \text{ and } q = 10\%$$

$$\therefore p > q$$

Hence, **option 3.**

127.



Consider the polygon as shown in the figure. Here 4 corners A, D, G and J are the concave corners and remaining 8 corners are convex corners.

In general, for a polygon with sides parallel to either of the axes, if  $n$  is the number of concave corners and  $m$  is the number of convex corners, then we have,

$$m - n = 4$$

$$\therefore m = 25$$

$$\therefore n = 21$$

Hence, **option 3.**

128. In the series  $a, b, b, c, c, c, d, d, d, d, e, e, e, e, \dots$

the first letter of the alphabet is written once, the second is written twice, and the  $n^{\text{th}}$  letter is written  $n$  times.

$\therefore$  The number of letters written up to the  $n^{\text{th}}$  letter is equal to the sum of the first  $n$  natural numbers given by,  $n(n + 1)/2$

$$\text{For } n = 23, n(n + 1)/2 = 276 \text{ and for } n = 24, n(n + 1)/2 = 300$$

This means the series contains 276 letters in all for the letter corresponding to  $n = 23$  and 300 letters in all for the letter corresponding to  $n = 24$ .

$\therefore$  The letter corresponding to  $n = 24$  will be the letter occupying the 277<sup>th</sup> to the 300<sup>th</sup> place in the series.

But,  $n = 24$  corresponds to letter x.

$\therefore$  The 288<sup>th</sup> letter in the series is x.

Hence, **option 4.**

129.  $p^2 + q^2 = (p + q)^2 - 2pq$  ... (i)

From given equation,  $p + q = \alpha - 2$  and

$pq = -\alpha - 1$

Substituting values in equation (i), we get,

$$\begin{aligned} p^2 + q^2 &= \alpha^2 + 4 - 4\alpha - 2(-\alpha - 1) \\ &= \alpha^2 + 4 - 4\alpha + 2\alpha + 2 \\ &= \alpha^2 - 2\alpha + 1 + 5 \\ &= (\alpha - 1)^2 + 5 \end{aligned}$$

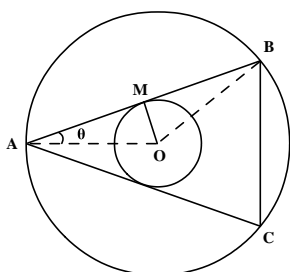
Minimum value of  $p^2 + q^2$  will be obtained by putting

$(\alpha - 1) = 0$

$\therefore$  Minimum value = 5

Hence, **option 4.**

130. Consider the diagram below, as per the given conditions.



Let  $r$  and  $R$  be the radii of the inner circle and outer circle respectively.

As area of the outer circle is 4 times the area of the inner circle, we have,  $R = 2r$

In  $\Delta OAM$ ,

$$\sin \theta = \frac{OM}{OA} = \frac{r}{2r} = \frac{1}{2}$$

$\therefore \angle OAM = \theta = 30^\circ$

Similarly,

$\angle OAM = \angle OBM = \angle OAC = \angle OCA = 30^\circ$

$\angle OBC = \angle OCB = 30^\circ$

$\therefore \angle BAC = \angle ACB = \angle CBA$

$\therefore \Delta ABC$  is an equilateral triangle.

$AB = 2 \times \sqrt{(OA^2 - OM^2)} = 2\sqrt{3}r$

Area of  $\Delta ABC$

$$= \frac{\sqrt{3}}{4} \times (AB)^2 = \frac{\sqrt{3}}{4} \times 3 \times r^2 = 3\sqrt{3}r^2 \quad \dots (i)$$

But, area of the outer circle =  $\pi(2r)^2 = 4\pi r^2 = 12$

$\therefore r^2 = \frac{3}{\pi}$

$\therefore$  Area of  $\Delta ABC = 3\sqrt{3} \times \frac{3}{\pi} = \frac{9\sqrt{3}}{\pi}$

Hence, **option 3.**

131.  $a + b + c + d = 4m + 1$

$a^2 + b^2 = (a + b)^2 - 2ab$

$a^2 + b^2$  is minimum when  $2ab$  is maximum.

The product of two numbers is maximum when the numbers are equal.

$\therefore a^2 + b^2$  is minimum when  $a = b$

Similarly,  $c^2 + d^2$  is minimum when  $c = d$

$\therefore a^2 + b^2 + c^2 + d^2$  is minimum when  $a = b$  and  $c = d$

$\therefore (a^2 + b^2 + c^2 + d^2) \min = 2(a^2 + c^2)$

But,  $a^2 + c^2$  is minimum when  $a = c$

$\therefore a^2 + b^2 + c^2 + d^2$  is minimum when  $a = b = c = d$

When  $a = b = c = d$ ,  $a + b + c + d$  is a multiple of 4.

But,  $a + b + c + d = 4m + 1$

So, one out of  $a, b, c, d$  must be one greater than the other three.

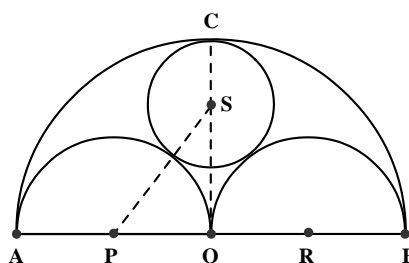
$\therefore a = b = c = m$  and  $d = m + 1$

$\therefore a^2 + b^2 + c^2 + d^2 = m^2 + m^2 + m^2 + (m + 1)^2$

$= 4m^2 + 2m + 1$

Hence, **option 2**

132. Consider the diagram below.



Let  $r$  be the radius of the smaller semi-circles and  $s$  be the radius of the smaller circle.

$OS = 2r - s$

$PS = r + s$

$PO = r$

But,  $\Delta PSO$  is a right-angled triangle.

$\therefore PS^2 = PO^2 + SO^2$

$(r + s)^2 = r^2 + (2r - s)^2$

$\therefore r^2 + s^2 + 2rs = r^2 + 4r^2 + s^2 - 4rs$

$\therefore s = \frac{2r}{3}$

$\therefore$  Total area not grazed

$$= \frac{1}{2} \pi(2r)^2 - \left[ 2 \times \frac{1}{2} \pi r^2 + \pi \left( \frac{2r}{3} \right)^2 \right]$$

$$= 2\pi r^2 - \pi r^2 - \frac{4}{9}\pi r^2$$

$$= \frac{5}{9}\pi r^2$$

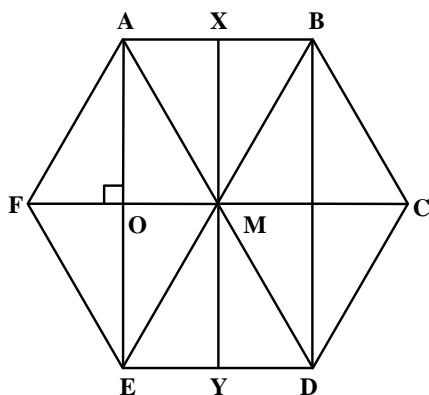
$$\therefore \text{Required percentage} = \frac{\frac{5}{9}\pi r^2}{2\pi r^2} \times 100$$

$$= \frac{5}{9 \times 2} \times 100$$

$$\approx 28\%$$

Hence, **option 2.**

133.



We can see that triangles AMF, AMB, BMC, CMD, DME and EMF are all equilateral triangles. Also, AE, XY and BD bisect MF, AB, ED and CM.

$\therefore$  All the small right triangles in the figure are congruent.

$$\therefore A(\Delta AOF) = \frac{1}{12} \times \text{the area of the hexagon ABCDEF}$$

Hence, **option 1.**

134.  $x, y$  and  $z$  are at hundred's, ten's and unit's position in a three digit number.

Both  $x$  and  $z$  have to be less than  $y$ .

When  $y = 9$ , then  $x$  can take values from 1 to 8 and  $z$  can take values from 0 to 8.

$\therefore$  Total number of ways in which this number can be written when  $y$  is 9 =  $8 \times 9 = 72$

The table given below represents the number of ways of writing this number for all possible values of  $y$  from 2 to 9

$x$	$y$	$z$	Total number of ways
8	9	9	$8 \times 9 = 72$ ways
7	8	8	$7 \times 8 = 56$ ways
6	7	7	$7 \times 6 = 42$ ways
5	6	6	$5 \times 6 = 30$ ways
4	5	5	$4 \times 5 = 20$ ways
3	4	4	$4 \times 3 = 12$ ways
2	3	3	$3 \times 2 = 6$ ways
1	2	2	$2 \times 1 = 2$ ways

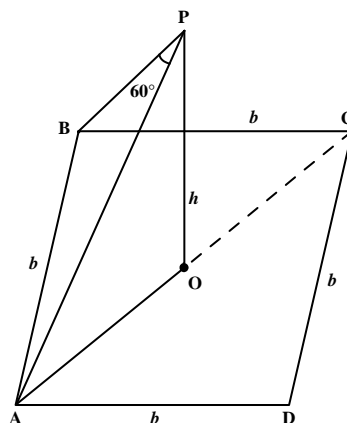
$\therefore$  Total number of ways

$$= 72 + 56 + 42 + 30 + 20 + 12 + 6 + 2 = 240$$

Hence, **option 3.**

135.  $OP = h$  and  $AB = b$

$$\text{Now, } OA = \frac{AC}{2} = \frac{b\sqrt{2}}{2} = \frac{b}{\sqrt{2}}$$



OP is a perpendicular tower at the centre O of the square.

In  $\Delta PAB$ ,  $PA = PB$

$$\therefore \angle PAB = \angle PBA = \angle APB = 60^\circ$$

$\therefore \Delta PAB$  is an equilateral triangle.

$$\therefore AP = b$$

In the right-angled  $\Delta AOP$ , we have,

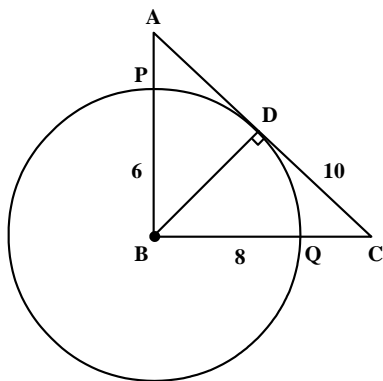
$$AP^2 = OP^2 + OA^2$$

$$\therefore b^2 = h^2 + \frac{b^2}{2}$$

$$\therefore 2h^2 = b^2$$

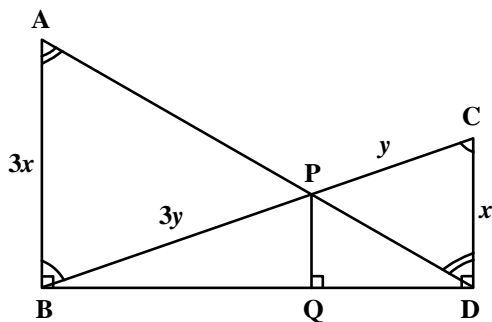
Hence, **option 2.**

136.



In  $\triangle ABC$ ,  $AB = 6$  cm,  $BC = 8$  and  $AC = 10$   
 $\therefore 6, 8, 10$  are Pythagorean triplets,  $\triangle ABC$  is a right triangle.  
 $BD$  is the perpendicular drawn from  $B$  to  $AC$ .  
 $\therefore A(\triangle ABC) = \frac{1}{2} \times 6 \times 8 = \frac{1}{2} \times BD \times 10$   
 $\therefore BD = 4.8$  cm  
 A circle with centre  $B$  is drawn which will intersect  $AB$  at  $P$  and  $BC$  at  $Q$ .  
 $\therefore AP = AB - PB = 1.2$  and  $QC = BC - BQ = 3.2$   
 $\therefore AP : QC = 3 : 8$   
 Hence, **option 4**.

137. Consider the figure below,



As  $AB \parallel CD$  and  $\angle ABD = \angle CDB = \angle PQD = 90^\circ$   
 $\therefore \angle BAP = \angle CDP$  and  $\angle ABP = \angle DCP$   
 $\triangle CPD \sim \triangle BPA$  ... (AAA test)

$$\therefore \frac{CP}{PB} = \frac{x}{3x} = \frac{1}{3}$$

If  $CP = y$ ,

$PB = 3y$

Now,  $\triangle CBD \sim \triangle PBQ$  ... (AA test)

$$\frac{CD}{PQ} = \frac{CB}{PB} = \frac{y + 3y}{3y} = \frac{4}{3} = 1 : 0.75$$

Hence, **option 2**.

138. The first layer has 1 ball.  
 Second layer has  $1 + 2 = 3$  balls  
 Third layer has  $1 + 2 + 3 = 6$  balls

$\therefore$  The  $n^{\text{th}}$  layer of the stack would have  $\frac{n(n+1)}{2}$  balls.

$\therefore$  Total balls in all the layers =  $\sum \left[ \frac{n(n+1)}{2} \right] = 8436$

$$\therefore \frac{1}{2} \times \left[ \frac{n(n+1)(2n+1)}{6} + \frac{n(n+1)}{2} \right] = 8436$$

Only  $n = 36$  satisfies the above equation.  
 Hence, **option 3**.

139. Let  $a_1, a_2, a_3, \dots, a_n$  be  $n$  positive real numbers.

Now,  $a_1 \times a_2 \times a_3 \times \dots \times a_n = 1$

We know that, A.M.  $\geq$  G.M.

$$a_1 + a_2 + a_3 + \dots + a_n \geq n \times (a_1 \times a_2 \times a_3 \times \dots \times a_n)^{1/n}$$

$$\therefore a_1 + a_2 + a_3 + \dots + a_n \geq n \times (1)^{1/n}$$

$$\therefore a_1 + a_2 + a_3 + \dots + a_n \geq n$$

Hence, **option 3**.

140.  $\log_3 2, \log_3 (2^x - 5), \log_3 (2^x - 7/2)$  are in A.P.

$$\therefore 2 \times \log_3 (2^x - 5) = \log_3 2 + \log_3 (2^x - 7/2)$$

$$\therefore \log_3 (2^x - 5)^2 = \log_3 [2 \times (2^x - 7/2)]$$

Let  $2^x = a$ , then we have,

$$(a - 5)^2 = 2 \times (a - 7/2)$$

$$\therefore a^2 - 10a + 25 = 2a - 7$$

$$\therefore a^2 - 12a + 32 = 0$$

$$\therefore a^2 - 8a - 4a + 32 = 0$$

$$(a - 8)(a - 4) = 0$$

$$a = 8 \text{ or } 4$$

$$2^x = 8 \text{ or } 2^x = 4$$

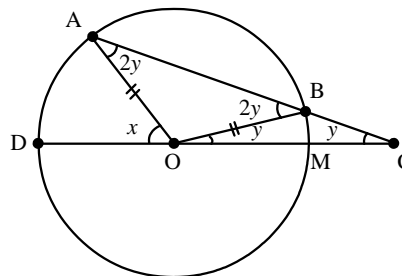
$$x = 3 \text{ and } x = 2$$

$x = 2$  cannot be the answer as  $(2^x - 5)$  would become negative and logarithms of negative numbers are not defined.

$$\therefore x = 3$$

Hence, **option 4**.

141.



Consider the figure shown above.

In  $\triangle OBC$ ,  $BC = OB$

$$\therefore \angle BOC = \angle BCO = y$$

... (i)

Also,  $OB = OA =$  Radius of the circle

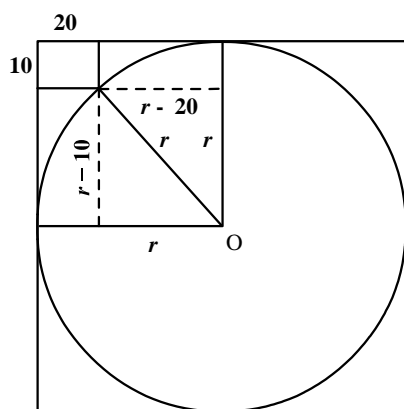
$\angle OBA$  is an exterior angle of  $\triangle OBC$ .

$$\therefore \angle OBA = \angle BOC + \angle BCO = 2y$$

$\therefore \angle OAB = \angle OBA = 2y$  ... (ii)  
 $\therefore$  In  $\triangle AOB$ ,  $\angle AOB = 180 - 4y$   
 Now,  $\angle AOD + \angle AOB + \angle BOC = 180^\circ$   
 $\therefore x + 180 - 4y + y = 180^\circ$   
 $\therefore x = 3y$   
 $\therefore$  The value of  $k = 3$   
 Hence, **option 1.**

Alternatively,  
 $m\angle ACD = 1/2 \times [m(\text{arc AD}) - m(\text{arc BM})]$   
 $\therefore 2y = x - y$   
 $\therefore x = 3y$   
 Hence, **option 1.**

142.



Consider the figure shown above. Let the radius of the circle be  $r$ .

$$\begin{aligned}
 (r - 20)^2 + (r - 10)^2 &= r^2 \\
 r^2 + 400 - 40r + r^2 + 100 - 20r &= r^2 \\
 r^2 - 60r + 500 &= 0 \\
 r^2 - 50r - 10r + 500 &= 0 \\
 r \times (r - 50) - 10 \times (r - 50) &= 0 \\
 r = 50 \text{ or } r = 10 \\
 \text{But, } r \text{ cannot be } 10. \\
 \therefore r &= 50
 \end{aligned}$$

Hence, **option 3.**

143.  $w = vz/u$

From the given range of values for  $u, v$  and  $z$ , we have,

Maximum possible value of  $w$  is 4 when  $v$  is 1,  $z$  is  $-2$  and  $u$  is  $-0.5$ .

Also minimum value of  $w$  is  $-4$  when  $v$  is  $-1$ ,  $z$  is  $-2$  and  $u$  is  $-0.5$ .

Hence, **option 2.**

144.

Box 1	Box 2	Box 3	Box 4	Box 5	Box 6
G	G	R	R	R	R
R	G	G	R	R	R
R	R	G	G	R	R
R	R	R	G	G	R
R	R	R	R	G	G

Case 1: only 1 box with green ball.  
Number of possible ways = 6

Case 2: 2 boxes with green balls  
Table shows that the green balls are placed in the boxes which are consecutively numbered.  
Number of possible ways = 5

Similarly,  
Case 3: 3 boxes with green balls  
Number of possible ways = 4

Case 4: 4 boxes with green balls  
Number of possible ways = 3

Case 5: 5 boxes with green balls  
Number of possible ways = 2

Case 6: 6 boxes with green balls  
Number of possible ways = 1  
 $\therefore$  Total number of ways =  $6 + 5 + 4 + 3 + 2 + 1 = 21$   
 Hence, **option 2.**

145.  $y = x^3 + x^2 + 5$  ... (i)  
 $y = x^2 + x + 5$  ... (ii)

Solving (i) and (ii), we get,  
 $x^3 + x^2 + 5 = x^2 + x + 5$   
 $x(x^2 - 1) = 0$   
 $\therefore x = 0, 1, -1$   
 $\therefore$  All three solutions for (i) and (ii) lie between  $-2$  and  $2$ .  
 $\therefore$  The two curves intersect thrice in the given range.  
 Hence, **option 4.**

146. For  $j = n$ ,  $2^{(n-n)} = 1$  student has answered wrongly  
 $j = n - 1$ ,  $2^{[n - (n-1)]} = 2$  students have answered wrongly  
 $j = 1$ ,  $2^{(n-1)}$  students have answered wrongly  
 $\therefore 1 + 2 + \dots + 2^{(n-1)} = 4095$

The series is in G.P. with common ratio  $r = 2$   
 $\therefore 1 \times (2^n - 1)/(2 - 1) = 4095$   
 $\therefore 2^n - 1 = 4095$   
 $\therefore 2^n = 4096$   
 $\therefore n = 12$   
 Hence, **option 1.**

147. The given expression may be represented as

$$\frac{x}{y} + \frac{x}{z} + \frac{y}{x} + \frac{y}{z} + \frac{z}{x} + \frac{z}{y}$$

We know that, A.M.  $\geq$  G.M.

$$\therefore \frac{\left(\frac{x}{y} + \frac{x}{z} + \frac{y}{x} + \frac{y}{z} + \frac{z}{x} + \frac{z}{y}\right)}{6}$$

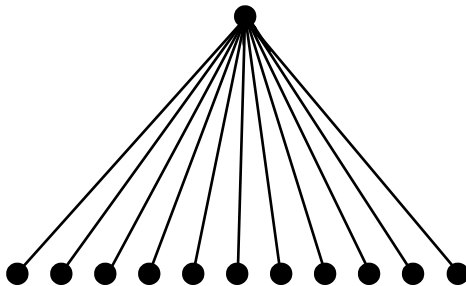
$$\geq \sqrt[6]{\frac{x}{y} + \frac{x}{z} + \frac{y}{x} + \frac{y}{z} + \frac{z}{x} + \frac{z}{y}}$$

$$\therefore \frac{x}{y} + \frac{x}{z} + \frac{y}{x} + \frac{y}{z} + \frac{z}{x} + \frac{z}{y} \geq 6$$

$\therefore$  The given expression will have a minimum value of 6.  
But  $x, y$  and  $z$  are distinct, so the value will always be greater than 6.

Hence, **option 3**.

148.



For a given triangle, any point can have 2 edges.

A graph with 12 points will have  $12 - 1 = 11$  edges at least as shown.

The maximum number of edges will occur when each point is connected to all the others.

$\therefore$  The first point will form 11 edges, the second will form 10 edges, the third will form 9 edges and so on.

$\therefore$  The maximum number of edges

$$= 11 + 10 + 9 + \dots + 1 = 66$$

$$\therefore 11 \leq e \leq 66$$

Hence, **option 1**.

*Alternatively,*

The maximum number of edges joining 12 points to each other =  ${}^{12}C_2 = 66$

To go from each point to every other point, we need at least 11 edges.

$$\therefore 11 \leq e \leq 66$$

Hence, **option 1**.

149. For  $(n - 1)(n - 2) \dots 3 \cdot 2 \cdot 1$  to not be divisible by  $n$ ,  $n$  should be a prime number.

But, there are 7 prime numbers in the range  $12 \leq n \leq 40$  are 7.

The prime numbers are 13, 17, 19, 23, 29, 31, 37.

Hence, **option 2**.

150. The sum of the first and last terms in  $T$  is 470.

Likewise, the sum of the second and second-last terms is also 470.

In general the sum of the  $n^{\text{th}}$  term from the beginning and the  $n^{\text{th}}$  term from the end is 470.

$\therefore$  Only one of each of these pairs of terms will be in  $S$ .  
(For instance only one of 3 and 467 can be in  $S$ )

$\therefore$  The set  $S$  can have a maximum of half of the terms in  $T$ .

The terms in  $T$  are in A.P. with a common difference of 8.

$$\text{Last Term} = 467 = 3 + (n - 1) \times 8$$

$$\therefore n = 59$$

$$\therefore \text{Total number of terms in the set } T = 59$$

$\therefore$  There are 29 pairs of numbers in  $T$  that add up to 470 and the 59<sup>th</sup> number is 235, which occurs in the middle of the series.

$\therefore S$  will be a set with 30 terms, with 29 terms which are from the pairs adding up to 470, and 235.

Hence, **option 4**.