Section I

1. Dipan's Group Scores are as follows:

    PCB Group $= 98 \times \left(\dfrac{3}{3}\right) = 98$

    Mathematics Group = 95

    Social Science Group $= \dfrac{96 + 95}{2} = 95.5$

    Vernacular Group $= \dfrac{96 + 94}{2} = 95$

    English Group $= \dfrac{96 + x}{2} = 48 + \left(\dfrac{x}{2}\right)$

    Dipan's final score = 96

    ∴ Sum of Dipan's Group Scores = 96 × 5 = 480

    ∴ $98 + 95 + 95.5 + 95 + 48 + \dfrac{x}{2} = 480$

    ∴ $\dfrac{x}{2} = 48.5$

    ∴ x = 97

    Dipan scored 97 marks in English Paper II.

    Hence, option 3.

2. From the table we can observe that only Dipan is eligible to apply for the prize.
    So Dipan gets the prize.
    Hence, option 4.

3. Dipan was the only boy to score at least 95 in at least one paper from each of the groups.
    Hence, option 1.

4. In order to maximize scores, each student would choose to improve score in the paper in which would affect the group score the most.
    Consider the options.
    Ram chooses Vernacular Paper I or II.
    His original group score in Vernacular group = 94

    His new score would change by $\dfrac{\dfrac{(94 + 100)}{2} - 94}{5} = 0.6$

    His new score = 96.1 + 0.6 = 96.7

    Agni chooses Vernacular Paper I.
    His original group score in Vernacular group = 87.5

His new score would change by $\dfrac{\dfrac{(93 + 100)}{2} - 87.5}{5} = 1.8$

His new score = 94.3 + 1.8 = 96.1

Pritam chooses History.
His original group score in Social Science group = 89

His new score would change by $\dfrac{\dfrac{(95 + 100)}{2} - 89}{5} = 1.7$

His new score = 93.9 + 1.7 = 95.6

Ayesha chooses Geography.
Her original group score in Social Science group = 94

His new score would change by $\dfrac{\dfrac{(95 + 100)}{2} - 94}{5} = 0.7$

Her new score = 96.2 + 0.7 = 96.9

Dipan chooses Mathematics.
His original group score in Mathematics group = 95
His new score would change by $\dfrac{100 - 95}{5} = 1$
His new score = 96 + 0.6 = 97, which is the highest among the five options.
Hence, option 5.

5. Group scores of Joseph, Agni, Pritam and Tirna in Social Science Group are 95.5, 95.5, 89 and 89.5 respectively. Their final scores are 95, 94.3, 93.9, 93.7 respectively. If their group scores in social science change to hundred their final scores will be affected by 4.5/5, 4.5/5, 11/5 and 10.5/5 respectively.
Their new final scores would be 95.9, 95.2, 96.1 and 95.8 respectively.
Their standing in decreasing order of final score would be Pritam, Joseph, Tirna, Agni.
Hence, option 1.

6. Let F and E have Erdös numbers f and e respectively at the beginning of the conference.
On the third day, A's and C's Erdös numbers become $(f + 1)$
The sum of Erdös numbers changed to 8 × 3 = 24

At the end of the third day, five members had identical Erdös numbers while the other three had distinct ones.

On the fifth day, E's Erdös numbers became $f + 1$ and this reduced the group's average by 0.5. This means that E's Erdös numbers was not $f + 1$ on the third day. Thus we have,

At the end of the third day, $5(f + 1) + f + e + y = 24$

Hence $6f + 5 + e + y = 24$

Hence $6f + e + y = 19$

At the end of the fifth day,

$6(f + 1) + f + y = 2.5 \times 8 = 20$

Hence $7f + y = 14$

As F has the smallest Erdös number, $f = 1$

$\therefore y = 7$

$\therefore e = 6$

Now, we can solve all the questions.

From the above explanation, the largest Erdös number at the end of the conference would be 7.

Hence, option 2.

7. As per the explanation given in the first question, the Erdös numbers of B, D, G, H and F did not change during the conference.
Hence, option 4.

8. As follows from the explanation given in the first question, C's Erdös number was $f + 1 = 2$ on the third day and thereafter.
Hence, option 2.

9. It can be inferred from the common explanation that E's Erdös number was 6.
Hence, option 3.

10. Since 5 participants had identical Erdös numbers at the end of day three and two of these were A and C whose Erdös numbers had changed on the same day, three had the same Erdös numbers at the beginning of the conference.
Hence, option 2.

11. Let the price of the share rise on x days and fall on y days. As the price increases by Rs.10 in the five days, we have:
$x + y = 5$ and $10x - 10y = 10$
Thus, $x = 3$ and $y = 2$
The price of the share goes up on 3 days and falls on 2 days.
The three days on which the price rises can be selected in $^5C_3 = 10$ ways
The following are the 10 cases:

		Day 1	Day 2	Day 3	Day 4	Day 5	Chetan		Michael	
							Cash	Shares	Cash	Shares
Case 1	**Opening**	100	110	120	130	120	1300	-10	3700	-30
	Closing	110	120	130	120	110				
Case 2	**Opening**	100	90	80	90	100	1300	-10	-800	10
	Closing	90	80	90	100	110				
Case 3	**Opening**	100	90	100	110	120	1300	-10	1200	-10
	Closing	90	100	110	120	110				
Case 4	**Opening**	100	110	100	110	100	1300	-10	0	0
	Closing	110	100	110	100	110				
Case 5	**Opening**	100	110	120	110	120	1300	-10	2400	-20
	Closing	110	120	110	120	110				
Case 6	**Opening**	100	110	120	110	100	1300	-10	1200	-10
	Closing	110	120	110	100	110				
Case 7	**Opening**	100	90	100	110	100	1300	-10	0	0
	Closing	90	100	110	100	110				
Case 8	**Opening**	100	110	100	110	120	1300	-10	1200	-10
	Closing	110	100	110	120	110				
Case 9	**Opening**	100	90	100	90	100	1300	-10	0	0
	Closing	90	100	90	100	110				
Case 10	**Opening**	100	110	100	90	100	1300	-10	0	0
	Closing	110	100	90	100	110				

Consider Case 5
Chetan sells on Days 1, 2 and 4 and buys on days 3 and 5.
Change in the number of shares he has = -30 + 20 = -10
Change in his cash = 10 × (110 + 120 + 120) – 10 × (110 + 110) = Rs 1300

Michael sells on days 2 and 4, but never buys as the share price does not go below Rs.90.
Change in the number of shares he has = -20
Change in his cash = 10 × (120 + 120) = Rs 2400

The other cases are evaluated in a similar manner.
Chetan sold on three consecutive days => Cases 1, 2 and 3.
Michael sold only once => Case 3.
∴ The price of the share at the end of day 3 = Rs 110
Hence, option 3.

12. Referring to the formulated table of the first question, Michael ends up with Rs 100 less cash than Chetan in cases 3, 6 and 8. In each of these cases, both of them hold the same number of shares at the end of day 5.
Hence, option 5.

13. This information corresponds to cases 4, 7, 9 and 10 from the solution table. The price at the end of day 4 in each of these cases is Rs 100.
Hence, option 2.

14. The maximum increase in combined cash balance of Chetan and Michael = 1300 + 3700 = Rs 5000 (case 1 from the table)
    Hence, option 4.

15. This information corresponds to case 2 from the table. The price at the end of day 3 was Rs 90.
    Hence, option 1.

16. Let the toll charged at junctions A, B, C and D be a, b, c and d respectively.
    Since the cost of travel including toll on routes S-A-T, S-D-T, S-B-A-T and S-D-C-T is the same.
    ∴ 14 + a = 13 + d = 9 + a + b = 10 + c + d
    Thus, b = 5, d – a = 1, c = 3
    If a = 0, d = 1, If a = 1, d = 2 and if a = 2, d = 3
    Hence, both options 2 and 3 satisfy the given criteria.

    Note: The question makers took care of this inconsistency while calculating scores.

17. Since the cost of travel including toll on routes S-A-T, S-B-C-T, S-B-A-T and S-D-C-T is the same.
    ∴ $14 + a = 7 + b + c = 9 + a + b = 10 + c + d$
    ∴ $b = 5, d = 2, c – a = 2$
    Only option 5 satisfies these criteria.
    Hence, option 5.

18. Since the cost of travel including toll on all routes is the same.
    ∴ $14 + a = 7 + b + c = 13 + d = 9 + a + b = 10 + c + d$
    ∴ $b = 5, d = 2, c = 3$ and $a = 1$
    Hence, option 4.

19. But we want traffic along S-A, S-B and S-D to be the same.
    As routes lead to C from both B and D, we can increase the toll at C so that the cost of travelling along S-B-C-T and S-D-C-T is more than that along the other three routes.
    Now, $14 + a = 9 + b = 13 + d$
    ∴ $a = 0, b = 5$ and $d = 1$
    Also, $7 + b + c > 14$ and $10 + d + c > 14$
    ∴ $c > 3$
    Hence, option 1.

20. If toll charges at all junctions are made 0, 100% traffic will pass through S-B-C-T. This is not possible.
    If toll charges at A and B are made 0, then 100% traffic will pass through S-B-A-T. This is also not possible.
    If toll charges at C and D are made 0, that at B are made Rs.3, then the traffic will get equally divided between S-D-C-T and S-B-C-T.
    Thus, the cost incurred will be Rs 10.
    Hence, option 3.

21. As K is included, L is included. So, N and U cannot be included. As U is not included, S and W are not included. One out of M and Q and one out of P and R will be included.
    Thus, the team will include: K, L, (M or Q) and (P or R).
    Hence, option 5.

22. If the team includes N, it does not include L and K.
    One out of M and Q can be included and one out of P, S and R can be included.
    If S is a member, so are U and W.
    Thus the possible teams are:

    1. N, M, P
    2. N, M, R
    3. N, Q, P
    4. N, Q, R
    5. N, M, S, U, W
    6. N, Q, S, U, W

    Hence, option 5.

23. If S is not included, the team can have P or R, M or Q, K and L.
    If S is included, the team will have S, U, W, M or Q, N.
    This is the largest possible team.
    Hence, option 4.

24. If K or L are included, N, U, S and W are excluded. One out of P and R and one out of M and Q are included. Thus the team has only 4 members.
    If P or R are included, the team can have M or Q, K and L. This team also has 4 members.
    A team having M can have S, U, W and N i.e., 5 members.
    Hence, option 3.

25. A team sized 3 has to have M or Q and P or R. The only other member that can be selected all alone is N.
    L cannot be selected as K has to be selected with him.
    Hence, option 1.

Section II

26. Statement 1 states, "It can feel like a treadmill that gets you nowhere". This can neither be experienced nor verified as it is a personal viewpoint, hence a judgment.

    Statement 2 is a personal viewpoint not necessarily agreed to by many. It is a judgment.

    Statement 3 is an opinion, neither verifiable or directly experienced. It is a judgement.

    Statement 4 is someone's personal assessment of his own experience. It is also a judgment.
    Hence, the correct answer is option 4.

27. The given options require you to evaluate statement 1 as either a Judgment or an Inference. 'Given the *poor quality* of services in the public sector … ' is more of a judgement than an inference. Based on this the conclusion "should be switching…." establishes statement 1 as a judgment. This eliminates option 3 and 4.

    The numbers in statement 2 are a result of direct verification. Hence it is easy to see that statement 2 is a fact. This eliminates option 2.

    Evaluating options 1 and 5 both of which say statement 4 is an inference, one has to now establish whether statement 5 is an inference or a judgment (as per the options 1 and 5).

    " … how ironic it is.." is neither verified nor verifiable through facts. Statement 4 is a judgment.

    Hence, the correct answer is option 1.

28. Statement 1 is an inference. "According to statistical indications …." tells us that what follows is based on statistics, hence an inference. This eliminates options 2 and 5.
    In statement 2 (to be evaluated as Judgement or Inference), though 'significant incentive' may be inferred by checking with available data, 'the vital link between healthy bodies and healthy minds' cannot be investigated for data – medical or otherwise. Hence, it is a judgment.
    Options 3 and 4 remain. The options state that sentence 3 is Fact. Sentence 4 to be evaluated as either an Inference or a Judgement. "… has to be a prerequisite for the evolution…." cannot be verified from facts making sentence 4 a Judgment.
    Hence, the correct answer is option 3.

29. Several things make statement 1 a judgment – 'should not be', 'hopelessly addicted', 'erroneous belief', and 'crookedness of Indians'; none of them are facts, nor verifiable inferences.

   Statement 2 is a combination of inference and facts. 'we have more red tape' is an inference, but 'we take 89 days etc..." is a fact. Since the thrust of the statement is base don the facts it has to be classified as a fact.

   Therefore options 3 and 4 are eliminated.

   Options 1, 2 and 5 remain. Statement 3 is classified in both options 2 and 5 as a Judgement.

   Statement 4 is to be evaluated a Judgement or an Inference. The first part of sentence 4 is a fact. In the second part, 'potential' is inferred based on facts/experiences. Hence it is an inference. This eliminates options 1 and 2.

   Hence, the correct answer is option 5.

30. The first sentence is to be evaluated as a Judgement or an Inference. 'Most sinister' is neither verified nor verifiable. It is clearly an opinion, making it a Judgement. This eliminates options 1, 3 and 5.

   Evaluating options 2 and 4, one has to decide whether statement 3 is an Inference or a Judgment. 'Only insurance' is neither a verified fact nor a verifiable inference. Hence it is a judgment, which eliminates option 4.
   Hence, the correct answer is option 2.

31. It is not a difficult choice, when one understands the concluding sentence of a paragraph should fulfill the purpose for which the paragraph is written leaving no loose ends that may require further clarification. The first three sentences of the paragraph establish this purpose. Then the writer provides certain example situations.

   Option 3 concludes the paragraph smoothly – the writer tells us what his 'alleged' rules are. In consistence with the conversational tone of the paragraph, the writer does not assert even his explanation with undue vigor in the last sentence.

   Option 1 is contrary to the purpose of the paragraph because 'guidance base don applied research' makes his actions more binding on others than are rules.

   Options 2 and 4 are also eliminated for the same reason.

   Option 5 talks about one of the examples and not related to the purpose of the paragraph.
   Hence, the correct answer is option 3.

32. All options begin with "as a result". One has the freedom to ignore this or to work intensely on this phrase. 'As a result' indicates that one needs to discover the immediate consequence of the details given in the paragraph.

    Option 4 is the first to get eliminated as it is not a consequence at all.

    Options 1 and 2 are not consequences but what may currently exist in the industry; as explained in the paragraph.

    Option 3 brings in 'adversary' and 'ally'. This is hardly sustained by the data in the paragraph, unless one justifies them. If one justifies them the option gets eliminated, because again, it is not a consequence, but what exists there.

    The direct consequence is stated briefly in option 5 bringing the paragraph to a smooth closure as no further clarification is required. "As a result" has to be worked upon and not ignored.

    Hence, the correct answer is option 5.

33. The word 'professes' towards the end is significant. 'However' is constant in the options. One needs to pick out the best contrast.

    Options 3 and 4 get easily eliminated as they contain 'history', which will require a lot of explanation in the context. The last sentence will not contain any new ideas requiring further clarification.

    Option 5 is eliminated because of 'penchant' – the paragraph does not make such assertions.

    For the same reason, the 'intention' in option 1 gets it eliminated.

    The word 'professes' in the paragraph directly leads to the 'veil' and 'understood' in option 2.

    Hence, the correct answer is option 2.

34. 'As a result' is a constant in the options. One needs identify the direct consequence of what is stated in the paragraph. Also establish the purpose of the paragraph by looking at the first and the last sentences given to you. ('Age has ...' and 'however, as people become older...').

    Options 3 and 5 get eliminated most easily. Neither of these options is a consequence of the curvilinear relationship between age and exploitation of opportunity.

    The reluctance to "experiment with new ideas" (options 1 and 2) does not include the 'entrepreneurial opportunity" in the paragraph.

Option 4 includes all this and is specific to the ideas presented in the paragraph and is a direct consequence.

Hence, the correct answer is option 4.

35. 'We can usefully think of theoretical models as maps.' The first sentence has established the purpose of the paragraph which is to understand the usefulness of theoretical models using the comparison of maps. This purpose is fulfilled in option 1 that they are invaluable.

That theoretical models 'will never represent' (option 2), 'need to balance" (option 3), 'are accurate only' (option 4) do not fulfill this purpose.

Option 5 is a generalization that the paragraph does not support.

Hence, the correct answer is option 1.

36. No other option merits evaluation. It has been clearly stated in the passage at two places. "*Despite the cruelties of the Stalin terror*, there was no Soviet Treblinka or Sorbibor, no extermination camps built to murder millions." Still later on, "*For all its brutalities and failures*, communism in the Soviet union, …" No option other than option 3 merits evaluation.

Hence, the correct answer is option 3.

37. "Part of the current enthusiasm in official western circles for dancing on the grave of communism is no doubt about relations with today's Russia and China. But it also reflect a determination to prove there is no alternative to the new global capitalist order – and that any attempt to find one is bound to lead to suffering." This is stated in the last paragraph. Also, there are reasons cited in the second paragraph: "Blaming class struggle and public ownership, …….. and they will only be content when they have driven a stake through its heart." This part of the passage also gives certain reasons which will answer the above question.

Based on these two parts of the passage, the options to be evaluated are option 2 and option 4. Option 4 gets eliminated because the question asks the 'real' reason. If communism did not pose a threat to capitalism, there is no need to destroy it completely. Mere survival of something cannot be sufficient reason to destroy it, unless it is a threat to something else. As a result option 2 becomes the *real* reason and not option 4.

Hence, the correct answer is option 2.

38. The reason why the writer cites examples of colonial atrocities has to be inferred from the passage. The writer's apparently pro-communism stand is attributable to his comparison of communism, colonialism, and Nazism. Comparing these three the writer argues that communism is the least evil of the three. The writer compares Colonialism to Nazism because the Council of Europe (Mr. Lindblad) and the 'anti-communists' compare communism to Nazism. The writer argues

that colonialism is closer to Nazism than is communism because of the motives of each. The writer terms colonialism and Nazism as 'racist despotism' whereas communism had helped a large number of people. He states: "It would be easier to take the Council of Europe's condemnation of communist state crimes seriously if it had also seen fit to denounce the far bloodier record of European colonialism …" The atrocities attributed to colonialism neutralizes the arguments of Lindblad against communism, and calls for an objective evaluation of communism, colonialism, and Nazism as mentioned in option 5.

The other options may appear close when the comprehension of the passage is not adequate. One may mistakenly choose option 4 in this case. However, option 4 though correct in the light of the passage is not the writer's purpose in citing the example.

Hence, the correct answer is option 5.

39. The writer, in the passage, establishes greater similarity between colonialism and Nazism than communism and Nazism because "the fashionable attempt (by Lidblad) to equate communism and Nazism is in reality a moral and historical nonsense." If communism has less to do with Nazism the question actually is what makes colonialism closer to Nazism?

Option 1 answers this question completely - that both are examples of tyranny …. or 'racist despotism'.

Option 3 may be chosen mistakenly if one is merely trying to find one of the intimate links between Nazism and colonialism without any reference to communism.
The other options do not merit an analysis.

Hence, the correct answer is option 1.

40. All options are compelling reasons for the silence of the Council of Europe about colonial atrocities, whereas option 4 is the compelling reason for its (council of Europe's) condemnation of communism.

Hence, the correct answer is option 4.

41. Option 1 is eliminated because 'a just society' is not a Utopia.

Options 2 and 5 are eliminated because though the passage mentions a hypothetical situation in which 'justice as fairness' could be formulated, the society is described/conceptualized in the passage is in no way 'hypothetical' as given in options 2 and 5.

Between options 3 and 4 the idea of fairness, which is casually mentioned in option 4, is fully explained in option 3 and is essential to answer the question, because the word 'fair' has a special and specific definition in the passage.

Hence, the correct answer is option 3.

42. The passage states: "In 'justice as fairness', the original position is not an actual historical state of affairs. It is understood as a purely hypothetical situation characterized so as to lead to a certain conception of justice. Among the essential features of this situation is that no one knows his place in society, his class position or social status, nor does anyone know his fortune in the distribution of natural assets and abilities, his intelligence, strength, and the like." This makes option 1 correct and a mere repetition of what is stated in the passage.

    Hence, the correct answer is option 1.

43. The passage states the conditions termed as 'veil of ignorance' thus: "In 'justice as fairness', the original position ...... is understood as a purely hypothetical situation characterized so as to lead to a certain conception of justice. Among the essential features of this situation is that no one knows his place in society, his class position or social status, nor does anyone know his fortune in the distribution of natural assets and abilities, his intelligence, strength, and the like. I shall even assume that the parties do not know their conceptions of the good or their special psychological propensities. The principles of justice are chosen behind a veil of ignorance."

    Option 4 fulfills these conditions best. The rule makers in the options cannot know even their sex in the next birth – a clear case of veil of ignorance. Situations in all the other options exhibit some degree of knowledge or awareness of their position etc.
    Hence, the correct answer is option 4.

44. One may evaluate options 1, 2 and 5 as likely answers. Options 3 and 4 are quickly eliminated.
    Option 3 is eliminated because 'fair in order to be just' is vague does not relate to the 'original agreement' included in the question.

    Option 4 talks about the 'evolution' of social institutions which is completely new to the ideas presented in the passage.

    Between options 1, 2 and 5 option 2 is the best answer because options 1 and 5 are partial.
    Option 1 leaves out 'original agreement' which is required to answer the question, and option 5 leaves out the idea of 'fairness' which is the crux of the passage.

    Hence, the correct answer is option 2.

45. The idea of 'justice as fairness" can be explained thus: From a hypothetical "initial position of equality" and "behind a veil of ignorance", "a group of persons must decide once and for all what is to count among them as just and unjust." The initial equality and veil of ignorance are crucial.

From such a position what one can choose as fair is only option 2. All others would be considered unfair from a position of 'no knowledge.' To clearly understand the correctness of option 2 and the erroneous nature of other options, one has to imagine oneself to be in the initial position choosing principles of justice under a veil of ignorance. In that case only 2 can be chosen, and not the others.

Hence, the correct answer is option 2.

46. The answer can be directly derived from "For the critical attitude is not so much opposed to the dogmatic attitude as super-imposed upon it: criticism must be directed against existing and influential beliefs in need of critical revision - in other words, dogmatic beliefs. A critical attitude needs for its raw material, as it were, theories or beliefs which are held more or less dogmatically."

Based on this principle option 1 is eliminated there is neither raw material nor any critical revision in the example of warriors.

Option 3 is eliminated because it talks about a transformation, whereas the passage only talks about a refinement.

Options 4 and 5 talk about something 'feeding' on something else. Science does not 'feed' on dogma. Both are eliminated at the same time.

Hence, the correct answer is option 2.

47. A casual reading of the passage is enough to convey to the reader that the writer believes that dogma is important, because dogmas are refined into science with time. With this superficial comprehension one is able to eliminate options 3, 4 and 5.

Between options 1 and 2, option 2 erroneously states that dogmas become science whereas dogma merely provide the substance or the hypothesis that later on get refined into science. Hence option 2 is eliminated.

Hence, the correct answer is option 1.

48. The answer is available with the analysis of this part of the passage: But dogmatic thinking, an uncontrolled wish to impose regularities, a manifest pleasure in rites and in repetition as such, is characteristic of primitives and children; and *increasing experience and maturity sometimes create an attitude of caution and criticism rather than of dogmatism*.

Option 1 is eliminated because 'education' is not the reason that the writer associates dogma with primitives and children.

Option 2 is eliminated for 'innocence'.

Option 3 is contrary to the italicized part of the sentence.

Option 5 is eliminated for 'civilization'.

Hence, the correct answer is option 4.

49. The last paragraph of the passage completely supports option 5. The question asks you to best support "critical attitude leads to a weaker belief". Option 5 supports this by stating that critical attitude leads to questioning and hypothesis – these weaken beliefs.

Option 1 states 'cannot lead to strong beliefs'. As we are in fact, asked to support this; it is not the best option.

Options 2 and 3 are eliminated for the 'noise', which does not suffice to support the notion.

Option 4 states what is required for 'strong beliefs' and does not support the thesis, 'critical attitude leads to a weaker belief'.

Hence, the correct answer is option 5.

50. Explicitly stated in the passage in paragraph 3. "For the *dogmatic attitudes clearly related to the tendency to verify our laws and schemata by seeking to apply them and to confirm them, even to the point of neglecting refutations, whereas the critical attitude is one of readiness to change them - to test them; to refute them; to falsify them, if possible.* This suggests that we may identify the critical attitude with the scientific attitude, and the dogmatic attitude with the one which we have described as pseudo-scientific."

Only option 3 best answers about the difference between science and pseudo-science.

The other options in this case do not merit evaluation.

Hence, the correct answer is option 3.

CAT 2006 Solutions

Section III

51.

Out of the options, only $\dfrac{1}{x}$ is negative.

All the others are positive.

$\therefore \dfrac{1}{x}$ is the smallest.

Hence, option 2.

52. $2^{1/2} = 2^{6/12} = (2^6)^{1/12} = 64^{1/12}$

Similarly, $3^{1/3} = 81^{1/12}$, $4^{1/4} = 64^{1/12}$, $6^{1/6} = 36^{1/12}$

Now, all the powers are equal. Thus the option with the largest base is the largest.

$3^{1/3}$ is the largest.

Hence, option 2.

53.

$$\frac{a}{d} = \frac{a}{b} \times \frac{b}{c} \times \frac{c}{d} = \frac{1}{3} \times 2 \times \frac{1}{2} = \frac{1}{3}$$

$$\frac{b}{e} = \frac{b}{c} \times \frac{c}{d} \times \frac{d}{e} = 2 \times \frac{1}{2} \times 3 = 3$$

$$\frac{c}{f} = \frac{c}{d} \times \frac{d}{e} \times \frac{e}{f} = \frac{1}{2} \times 3 \times \frac{1}{4} = \frac{3}{8}$$

$$\therefore \frac{abc}{def} = \frac{1}{3} \times 3 \times \frac{3}{8} = \frac{3}{8}$$

Hence, option 1.

54. Let the original length, breadth and height of the room be $3x$, $2x$ and x respectively.
∴ The new length, breadth and height are $6x$, x and $x/2$ respectively.
Area of four walls = (2 × length × height) + (2 × breadth × height)
Original area of four walls = $6x^2 + 4x^2 = 10x^2$
New area of four walls = $6x^2 + x^2 = 7x^2$
∴ Area of wall decreases by $[(10x^2 - 7x^2)/10x^2] \times 100 = 30\%$

Hence, option 5.

55.

$$t_n = \frac{n}{n+2}$$

$$\therefore \ t_3 = \frac{3}{3+2} = \frac{3}{5}$$

$$t_4 = \frac{4}{4+2} = \frac{4}{6}$$

$$t_5 = \frac{5}{5+2} = \frac{5}{7}$$

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$$t_{51} = \frac{51}{53}$$

$$t_{52} = \frac{52}{54}$$

$$t_{53} = \frac{53}{55}$$

$$\therefore t_3 \times t_4 \times t_5 \times \ldots \times t_{53} = \frac{3}{5} \times \frac{4}{6} \times \frac{5}{7} \times \ldots \times \frac{51}{53} \times \frac{52}{54} \times \frac{53}{55}$$

$$= \frac{(3 \times 4)}{(54 \times 55)} = \frac{2}{495}$$

Hence, option 1.

56. Let there be n rows and a students in the first row.
∴ Number of students in the second row = $a + 3$
∴ Number of students in the third row = $a + 6$ and so on.
∴ The number of students in each row forms an arithmetic progression with common difference = 3
The total number of students = The sum of all terms in the arithmetic progression

$$= \frac{n[2a + 3(n-1)]}{2} = 630$$

Now consider options.

1. $n = 3$

$$\frac{3[2a + 3(3 - 1)]}{2} = 630$$

$\therefore a = 207$

2. $n = 4$

$$\frac{4[2a + 3(4 - 1)]}{2} = 630$$

$\therefore a = 153$

3. $n = 5$

$$\frac{5[2a + 3(5 - 1)]}{2} = 630$$

$\therefore a = 120$

4. $n = 6$

$$\frac{6[2a + 3(6 - 1)]}{2} = 630$$

$\therefore a = \frac{195}{2}$

5. $n = 7$

$$\frac{7[2a + 3(7 - 1)]}{2} = 630$$

$\therefore a = 81$

As a is an integer, only $n = 6$ is not possible.

Hence, option 4.

57. $2^{0.7x} \times 3^{-1.25y} = 2^{7/2} \times 3^{-5/2} = 2^{0.7 \times 5} \times 3^{-1.25 \times 2}$

$x = 5$ and $y = 2$

These values of x and y satisfy the second equation also.

Hence, option 5.

58. $2x + y = 40$

∴ $y = 40 - 2x$

x and y are positive integers and $x \leq y$

If $x = 1, y = 38$

$x = 2, y = 36$

$x = 3, y = 34$

.

.

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$x = 12, y = 16$

$x = 13, y = 14$

$x = 14, y = 12$

∴ For $x > 13, y \leq x$

∴ There are 13 solutions to the given equation.

Hence, option 2.

59.
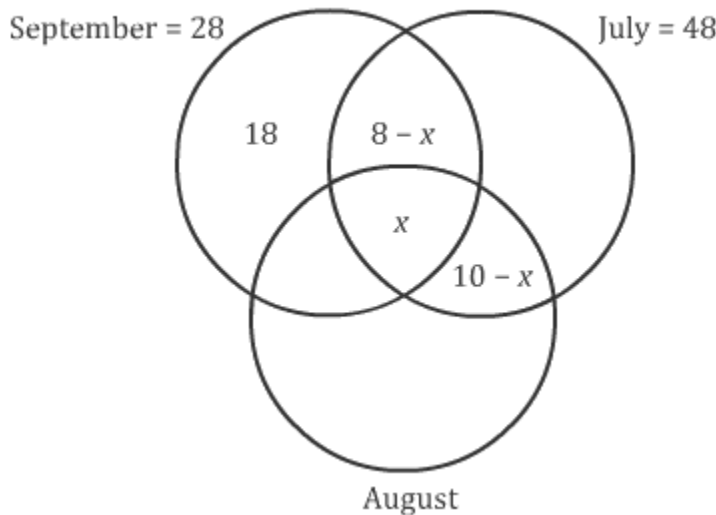
100 – 24 = 76 had read at least one issue.

If x people read all the three issues, then $(8 - x)$ people read only the September and July issues.

23 people read the September issue but not the August issue.

∴ $18 + 8 - x = 23$

∴ $x = 3$

As 28 people read the September issue, $[28 - (8 - 3) - 3 - 18] = 2$ people read only the August and September issues.

As 10 people read the July and August issues, $10 - 3 = 7$ people read only the July and August issues.

∴ The number of people who have read exactly two consecutive issues = 7 + 2 = 9

Hence, option 2.

60. The four consecutive two-digit odd numbers will have (1, 3, 5, 7) or (3, 5, 7, 9) or (5, 7, 9, 1) or (7, 9, 1, 3) as units digits.
    As the sum divided by 10 yields a perfect square, the sum is a multiple of 10.
    ∴ The units digits have to be (7, 9, 1, 3).
    Thus the four numbers will be $(10x + 7)$, $(10x + 9)$, $(10x + 11)$ and $(10x + 13)$, where $0 < x < 9$ (as each of these numbers is a two digit number)
    Sum of these numbers = $40x + 40 = 40(x + 1)$
    Now, $40(x + 1)/10 = 4(x + 1)$ is a perfect square
    As 4 is a perfect square $(x + 1)$ is some perfect square < 10
    $x + 1 = 4$, $x = 3$, and the four numbers are 37, 39, 41 and 43
    $x + 1 = 9$, $x = 8$, and the four numbers are 87, 89, 91 and 93

    Hence, option 3.

61. All the given graphs are drawn to the same scale.
    We can see that the line makes an angle which is more than 45° with the horizontal axis.
    ∴ The slope of the line is greater than 1.
    Let the slope be k.
    ∴ $(y − x) = k(y + x)$ {∵ $k > 1$}
    ∴ $y − x = ky + kx$

    ∴ $y = \dfrac{x(k + 1)}{(1 − k)}$

    $\dfrac{(k + 1)}{(1 − k)}$ is negative and $\left|\dfrac{(k + 1)}{(1 − k)}\right| > 1$

    ∴ The graph of y against x will be such that when x is positive, y is negative and $|x| < |y|$, except at (0, 0).

    Hence, option 4.

62. Let there be n terms ($n ≥ 3$) in the arithmetic progression having 1 as the first term and 1000 as the last. Let d be the common difference. Then,
    $1000 = 1 + (n − 1) × d$
    ∴ $999 = (n − 1) × d$ ... (i)
    $999 = 1 × 33 × 37$
    ∴ Factors of 999 are 1, 3, 9, 27, 37, 111, 333 and 999
    Substituting in equation (i)
    If $d = 1$, $n = 1000$
    If $d = 3$, $n = 334$
    If $d = 9$, $n = 112$
    If $d = 27$, $n = 38$
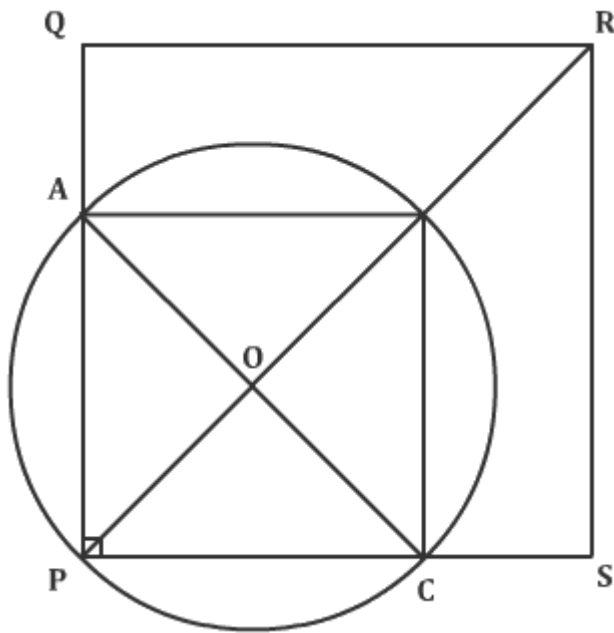   If $d = 37$, $n = 28$
    If $d = 111$, $n = 10$
    If $d = 333$, $n = 4$
    If $d = 999$, $n = 2$, which is not possible as $n > 2$
    ∴ 7 arithmetic progressions can be formed.
    Hence, option 4.

63.

Let PQRS be the square sheet and let the hole have centre O.
As P lies on the circumference of the circle and as m ∠APC = 90°, AC is a diameter.
∵ BP is a diameter, m ∠PAB = m ∠BCP = 90°
∵ BP = AC, ABCP is a square.
∴ $m\angle POC = 90°$ and OP = PC = 1 unit
The area of part of the circle falling outside the square sheet
= 2 × (Area of sector OPC – Area of Δ OPC)

$$= 2 \times \left[\left(\frac{\pi \times 1^2}{4}\right) - \left(\frac{1}{2} \times 1^2\right)\right]$$

$$= \frac{\pi - 2}{2} \text{ sq. units}$$

Area of part of hole on sheet =
Area of hole – Area of part of the circle falling outside the square sheet

$$= \pi - \left(\frac{\pi - 2}{2}\right) = \frac{\pi + 2}{2} \text{ sq. units}$$

Part of square remaining after punching = Area of square – Area of part of hole on sheet

$$= 4 - \left(\frac{\pi - 2}{2}\right) = \frac{6 - \pi}{2} \text{ sq. units}$$

∴ Proportion of sheet area that remains after punching $= \dfrac{\left(\dfrac{6 - \pi}{2}\right)}{4} = \dfrac{6 - \pi}{8}$

Hence, option 2.

64. Using the above, option 4 is the correct answer.

65.

$x^{\frac{2}{3}} + x^{\frac{1}{3}} - 2 \leq 0 \ldots (I)$

Put $y = x^{\frac{1}{3}}$

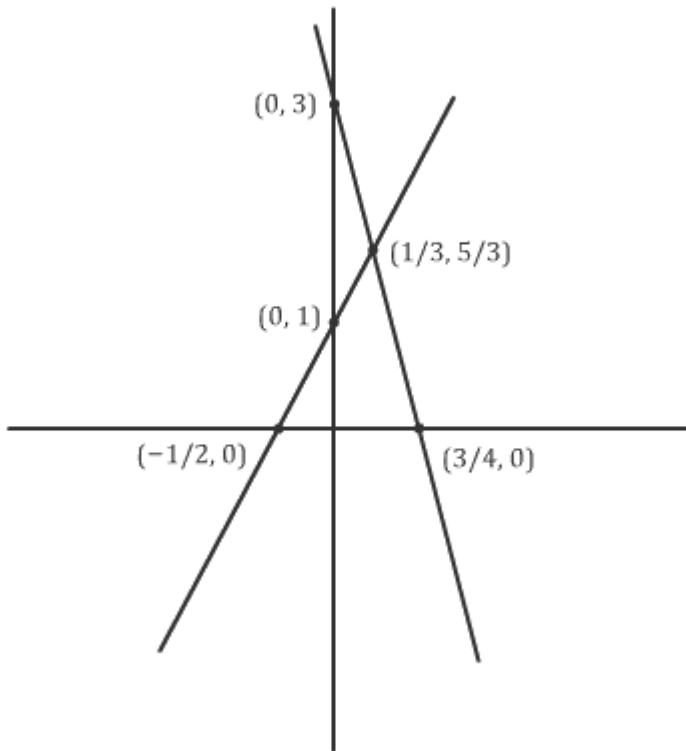Then equation (I) becomes $y^2 + y - 2 \leq 0$

$(y + 2)(y - 1) \leq 0$

$-2 \leq y \leq 1$

$-2 \leq x^{\frac{1}{3}} \leq 1$

$-8 \leq x \leq 1$

Hence, option 1.

66.

Let the two lines represent the equations $y = 2x + 1$ and $y = 3 - 4x$

The greater value between $2x + 1$ and $3 - 4x$ is greater than 5/3

when $x < 1/3$ or $x > 1/3$. The greater value is minimum at $x = 1/3$ and this value is 5/3.

Hence, option 5.

Note: In general, the minimum value of the function $f(x) = \max (ax + b, cx + d)$ occurs when $ax + b = cx + d$

67. Let f kg be the free luggage allowance and let Raja and Praja have r kg and p kg excess luggage respectively.
Let x be the fixed rate per kg for excess luggage.
$\therefore 2f + r + p = 60$ ... (i)
$rx = 1200$ ... (ii)
$px = 2400$ ... (iii)
$(60 - f)x = 5400$ ... (iv)
From (ii) and (iii),
$p = 2r$ ... (v)
Substituting in (i),
$2f + 3r = 60$
$\therefore f = 30 - 3r/2$ ... (vi)
Substituting in (iv),
$(60 - 30 + 3r/2)x = 5400$
$\therefore 30x + 3rx/2 = 5400$
From (ii),
$rx = 1200$
$\therefore 30x = 3600$
$\therefore x = 120$
$\therefore r = 10$, $p = 20$ and $f = 15$
Hence, option 4.

68. $f = 15$ kg

Hence, option 2.

69. Arun has travelled 60 km when Barun starts.

Barun overtakes Arun in $60/(40 - 30) = 6$ hrs

In this time, Barun travels $6 \times 40 = 240$ km from the starting point.

Kiranmala overtakes Arun at the same point.

Kiranmala takes $240/60 = 4$ hrs to reach there.

Arun takes $240/30 = 8$ hrs to reach there.

$\therefore$ Kiranmala starts $8 - 4 = 4$ hrs after Arun.

Hence, option 3.

70. Let $10x + y$ be a two digit number, where x and y are positive single digit integers and $x > 0$.
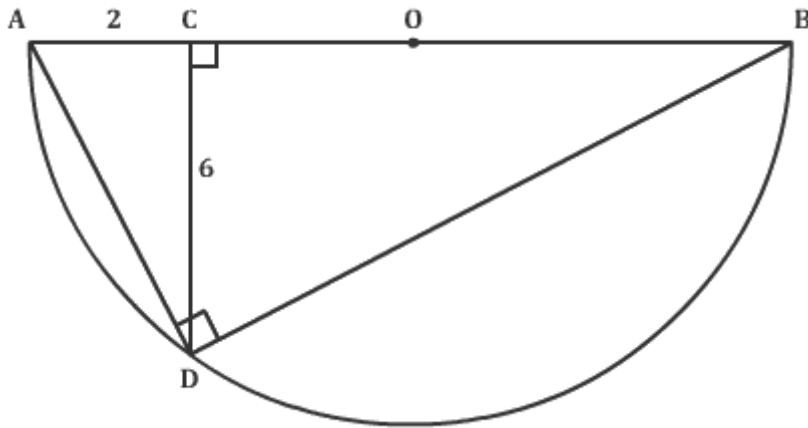Its reverse $= 10y + x$
Now, $10y + x - 10x - y = 18$
$\therefore 9(y - x) = 18$
$\therefore y - x = 2$

Thus y and x can be (1, 3), (2, 4), (3, 5), (4, 6), (5, 7), (6, 8) and (7, 9)
∴ Other than 13, there are 6 such numbers.
Hence, option 2.

71.

Let CD = x cm
Δ ACD and Δ ADB are similar triangles.
∴ AD/AB = AC/AD
∴ AD² = AC × AB
∴(AC² + CD²) = 2 × (2 + x)
∴ 40 = 2 × (2 + x)
∴ x = 18
∴ Diameter AB = 20 cm
∴ Radius = 10 cm
∴ Area = 50π sq. cm.
Hence option 2.

72. Task 2 can be assigned in 2 ways (either to person 3 or person 4).

Task 1 can then be assigned in 3 ways (persons 3 or 4, 5 and 6)

The remaining 4 tasks can be assigned to the remaining 4 persons in 4! = 24 ways

∴ The assignment can be done in 24 × 2 × 3 = 144 ways

Hence, option 1.

73. Consider options. As the number of employees is prime we can add the numerator and denominator of ratios directly to find the number of employees.
1. Number of employees = 101 + 88 = 189
   Number of employees = 189, which is not a prime number.
   ∴ Option 1 is eliminated.
2. Number of employees = 87 + 100 = 187
   Number of employees = 187, which is not a prime number.

∴ Option 2 is eliminated.
3. Number of employees = 110 + 111 = 221
   Number of employees = 221, which is not a prime number.
   ∴ Option 3 is eliminated.
4. Number of employees = 85 + 98 = 183
   Number of employees = 183, which is not a prime number.
   ∴ Option 4 is eliminated.
5. Number of employees = 97 + 84 = 181
   Number of employees = 181, which is a prime number.

∴ The ratio of employees = 97:84
Hence, option 5.

74.

If $\log_y x = a. \log_z y = b. \log_x z = ab$

∵ $a. \log_z y = ab$

∴ $b = \log_z y$

∵ $b. \log_x z = ab$

∴ $a = \log_x z$

∴ $\log_y x = ab = \log_z y \times \log_x z$

∴ $\dfrac{\log x}{\log y} = \dfrac{\log y}{\log x} \times \dfrac{\log z}{\log x}$

∴ $\dfrac{\log x}{\log y} = \dfrac{\log y}{\log x}$

∴ $(\log x)^2 = (\log y)^2$

∴ $\log x = \pm \log y$

∴ $\log x = \log y$ or $\log x = -\log y$

∴ $x = y$ or $x = \dfrac{1}{y}$

∴ $ab = \log_y x = 1$ or -1

Only option 5 does not satisfy this.

Hence, option 5.

75.
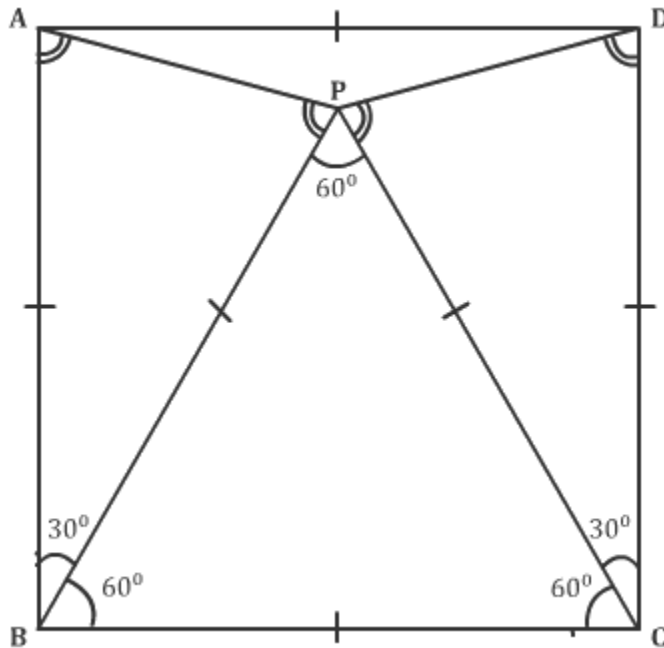
AP = PC = BC
$m\angle$BPC = $m\angle$PCB = $m\angle$PBC = 60°
Also, PC = CD = BP = AB
Δ ABP and Δ PCD are isosceles triangles.
$m\angle$ABP = $m\angle$PCD = 90 – 60 = 30°
∴ $m\angle$APB = $m\angle$DPC = (180 – 30)/2 = 75°
∴ $m\angle$APD = 360 – ($m\angle$APB + $m\angle$DPC + $m\angle$BPC) = 360 – (75 + 75 + 60) = 150°

Hence, option 5.