CAT Sample Paper 4
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Quantitative Ability

DIRECTIONS *for questions 1 to 13:* **Answer the questions independently of each other.**

1.   Ramu and Somu are competing in a 100 m race. Initially, Ramu runs at twice Somu's speed for the first fifty metres. After the 50 m mark, Ramu runs at 1/4th his initial speed while Somu continues to run at his original speed. If Somu catches up with Ramu at a distance of '*x*' metres from the finish line, then find *x*.

(1) 37.5
(2) 25
(3) 75
(4) 42.5
(5) Somu will never catch up with Ramu

2. When the curves *y* = 10^x and *xy* = 1 are drawn in the X-Y plane, how many times do they intersect for values of *y* ³ 2?

(1) Never
(2) Once
(3) Twice
(4) Thrice
(5) More than thrice

3. Anoop found the product, P, of two two-digit natural numbers, M and N. He then reversed the digits of each of M and N and found the product of the resultant numbers. Interestingly, he found both products to be the same. If the product of the tens digit of M and the tens digit of N is prime, find the sum of all the possible values of P that Anoop could have obtained.

(1) 2604
(2) 2712
(3) 2627

(4) 4684

(5) 4664

4.   Three circles of equal radii have been drawn inside an equilateral triangle, of side *a*, such that each circle touches the other two circles as well as two sides of the triangle. Then, the radius of each circle is

(1) $\dfrac{a}{2(\sqrt{3}+1)}$

(2) $\dfrac{a}{2(\sqrt{3}-1)}$

(3) $\dfrac{a}{\sqrt{3}+1}$

(4) $\dfrac{a}{\sqrt{3}-1}$

(5) $\dfrac{a}{4(\sqrt{3}-1)}$

5.   Thirty-six equally spaced points - P_1 through P_{36} - are plotted on a circle, and some of these points are joined successively to form a regular polygon. How many distinct such regular polygons are possible?

(1) 7

(2) 23

(3) 37

(4) 27

(5) None of these

6.   If *l* + *m* + *n* ¹ 0, which of the following conditions must *l*, *m* and *n* satisfy so that the system of simultaneous linear equations *x* + 3*y* - 4*z* = *l*, 2*x* - *y* - *z* = *m*, *x* + *y* - 2*z* = *n* has at least one ?

(1) 3*l* - 2*m* + 7*n* = 0

(2) 3*l* - 2*m* - 7*n* = 0

(3) 3*l* + 2*m* - 7*n* = 0

(4) 2*l* + 3*m* + 7*n* = 0

(5) 2*l* + 3*m* - 7*n* = 0

7.   There are *n* terms in an arithmetic progression. The *n* terms of the arithmetic progression are now distributed into eight sub-series - S_1, S_2 ……and S_8 - as follows. The 1st, 9th, 17th terms and so on go into S_1; the 2nd, 10th, 18th terms and so on go into S_2; the 3st, 11th, 19th

terms and so on go into S_3, and so on for S_4 till S_8. If for exactly three of the eight sub-series, the average of the sub-series is a term of the same sub-series, which of the following could be a possible value of *n*?

(1) 37
(2) 53
(3) 49
(4) 50
(5) 51

8. What is the minimum value of the expression $2x^2 + 3y^2 - 4x - 12y + 18$?

(1) 18
(2) 10
(3) 4
(4) 0
(5) -10

9. One day the king summoned all the soldiers in his army and made them stand in a queue. To the first soldier, he gave three gold coins and to every subsequent soldier, he gave four gold coins more than what he gave to the previous soldier. Then the king ordered each soldier to distribute all the coins that he received among the peasants, if and only if it is possible to distribute the coins such that each peasant to whom the soldier distributes gets as many coins as the number of peasants to whom the soldier distributes the coins. If no two soldiers were allowed to distribute coins to the same peasant and there were a total of 4000 soldiers in the king's army, how many peasants received at least one gold coin?

(1) 386
(2) 284
(3) 576
(4) 4000
(5) None of these

10. Two cyclists, Arjun and Bhim, started towards O from P and Q respectively, along the path shown below, in opposite directions. They met for the first time at 9:00 a.m. at O. At this moment, they reversed their directions but maintained their respective initial speeds and met for the second time at 10:30 a.m., following which

Arjun reached O for the second time 75 minutes after Bhim reached O for the second time. What is the ratio of the speeds of Arjun and Bhim?
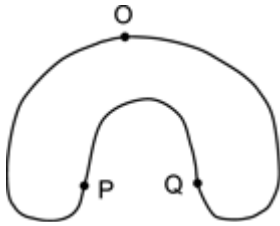
(1) 1 : 2
(2) 2 : 3
(3) 3 : 4
(4) 1 : 3
(5) Cannot be determined

11.   Which of the following is NOT a possible number of regions into which three straight lines (of infinite extent) can divide a plane?

(1) 7
(2) 6
(3) 5
(4) 4
(5) None of these

12.   The average of the numbers of a set P, consisting of 20 numbers, is 20. There are 20 numbers in another set Q = {a_i : i = 1, 2, 3, ….20}. Now, all the 20 numbers, starting from a_1 to a_{20}, in that order, are shifted from the set Q to the set P, one after the other. During the process of shifting, it was observed that when the number a_i was shifted from set Q to set P, the average of the numbers of set P increased by b_i, where b_{i+1} - b_i = 1, for 1 £ i £ 19. If b_1 = 2, what is the average of the original 20 numbers of set Q?

(1) 250
(2) 230
(3) 480
(4) 240
(5) 62

13.   The product of three numbers is 1620. If the HCF of any two out of the three numbers is 3, what is their LCM?

(1) 180
(2) 135
(3) 90
(4) 270
(5) 288

DIRECTIONS *for questions 14 and 15:* **Answer the questions on the basis of the information given below.**

A single file of red ants and a single file of black beetles, both marching in opposite directions, are approaching each other. Every ant eats every fifth beetle that it comes across while every beetle eats every third ant that it comes across. If an ant and a beetle try to eat each other then the beetle always eats the ant.

14. If the total number of ants and beetles initially is 13 and 27 respectively, then the total number of survivors after the two files completely cross each other is

(1) 18
(2) 19
(3) 22
(4) 20
(5) None of these

15. If the size of the file of ants is 13, then the minimum file size of the beetles such that the casualties on either side are the same is

(1) 33
(2) 35
(3) 32
(4) 31
(5) 39

DIRECTIONS *for questions 16 to 18:* **Answer the questions independently of each other.**

16. Little Euclid was playing with a cuboidal box, with a square base, and 14 identical wooden spheres. He observed that he could snugly and perfectly arrange exactly nine of the fourteen spheres at the bottom of the box in a single layer comprising three rows and three columns. He then placed another layer of four spheres, stably and symmetrically on top of the bottom layer (i.e., such that each

sphere in the second layer touched exactly four spheres of the bottom layer). Finally he placed the last sphere, stably and symmetrically, on top of the second layer and observed that he could then just close the lid of the box. Find the ratio of the height of the box to the radius of each sphere.

(1) $2(2\sqrt{3}-1)$

(2) $2(\sqrt{2}+1)$

(3) $2(\sqrt{3}+1)$

(4) $3(2\sqrt{2}-1)$

(5) None of these

17.   This year, during the months of January and February, every day Ramu went to a fruit shop and bought three varieties of fruits, such that when any two days are considered, he bought at least one variety of fruit on one of the days that was different from what he bought on the other day. What is the minimum number of different varieties of fruits he could have bought during that period?

(1) 9

(2) 8

(3) 18

(4) 60

(5) 14

18.   In a triangle ABC, AB = AC, BC = 6 cm and BE and CF are the medians drawn to AC and AB respectively. If BE ^ CF, then find AC (in cm).

(1) $3\sqrt{10}$

(2) $6\sqrt{5}$

(3) $4\sqrt{10}$

(4) $8\sqrt{5}$

(5) Cannot be determined

DIRECTIONS *for questions 19 and 20:* **In each of the following questions, there is a main statement (MS) followed by two additional statements A and B. Study whether the data given in each of these three statements is inconsistent or not inconsistent with the data given in the other two statements and mark the correct option.**

Note : Two statements are considered to be inconsistent (i.e., not consistent) with each other, if the data given in one statement contradicts the data given in the other statement or if it is possible

to arrive at conclusions that contradict each other using the two statements.

19. MS : There are two filling pipes A and B, which when opened together can fill an empty tank in 24 minutes.
A : A alone can fill the empty tank in 40 minutes.
B : If A and B were opened in alternate minutes, the empty tank would be filled in $48^2/_3$ minutes.

(1) MS is not inconsistent with A but is inconsistent with B or if MS is not inconsistent with B but is inconsistent with A.

(2) MS is inconsistent with neither A nor B but A and B are inconsistent with each other.

(3) MS is inconsistent with neither A nor B and A and B are also not inconsistent with each other.

(4) None of the above three are applicable.

20. MS : The cost of 3 pens, 4 erasers and 5 sharpeners is Rs.54.
A : The cost of 4 pens, 4 erasers and 6 sharpeners is Rs.64.
B : The cost of 2 pens, 3 erasers and 5 sharpeners is Rs.47.

(1) MS is not inconsistent with A but is inconsistent with B or if MS is not inconsistent with B but is inconsistent with A.

(2) MS is inconsistent with neither A nor B but A and B are inconsistent with each other.

(3) MS is inconsistent with neither A nor B and A and B are also not inconsistent with each other.

(4) None of the above three are applicable.

Logical & Data Interpretation

DIRECTIONS *for questions 21 to 23:* **Answer the questions on the basis of the information given below.**

  The table below gives details of all the models of cars at a car rental agency.

Model	Manufacturer	Classification	Engine Capacity (in cc.)	Plus Points of the Car	Minus Points of the Car
M800	Maruti	Entry Level	< 1000	Price, Fuel efficiency	Comforts, Space
Zen	Maruti	Small	1000 – 1300	Service, Fuel efficiency	Comforts, Space
Santro	Hyundai	Small	1000 – 1300	Price, Fuel efficiency	Design, Space
Ikon	Ford	Mid Size	1301 – 1500	Technology, Comforts	Service, Fuel efficiency
City	Honda	Mid Size	1301 – 1500	Technology, Comforts	Design, Price
Optra	General Motors	Executive	1501 – 1800	Comforts, Price	Engine, Fuel efficiency
Corolla	Toyota	Executive	1501 – 1800	Engine, Comforts	Design, Price
Accord	Honda	Luxury	1800+	Price, Space	Design, Fuel efficiency
C-Class	Mercedes	Luxury	1800+	Technology, Safety	Space, Price
Swift	Maruti	Mid Size	1301 – 1500	Design, Technology	Space, Price
Octavia	Skoda	Executive	1501 – 1800	Fuel efficiency, Price	Space, Service
Lancer	Mitsubshi	Executive	1501 – 1800	Price, Service	Technology, Comforts
Wagon R	Maruti	Small	1000 – 1300	Technology, Service	Design, Space
Camry	Toyota	Luxury	1800+	Space, Technology	Price, Fuel efficiency
Alto	Maruti	Entry Level	< 1000	Price, Fuel efficiency	Space, Comforts
Fiesta	Ford	Mid Size	1301 – 1500	Technology, Price	Space, Comforts
E-Class	Mercedes	Luxury	1800+	Technology, Comforts	Price, Fuel efficiency
Vectra	General Motors	Luxury	1800+	Technology, Comforts	Design, Space
Mondeo	Ford	Luxury	1800+	Engine, Comforts	Price, Service
Baleno	Maruti	Executive	1501 – 1800	Price, Service	Design, Comforts

The agency has three major clients - companies A, B and C - which regularly source cars from the agency. The specifications of cars required by each company are given below.

Company A: *Any car with an engine capacity of more than 1300 cc. and with comforts or space as one of the plus points.*

Company B: *All cars with a classification up to executive level (i.e., entry level, small, mid size and executive level) with good fuel efficiency (i.e., fuel efficiency must be one of the plus points of the car).*

Company C: *Any car for which space or fuel efficiency is not one of its minus points.*

21. **If the agency has only one car of each model and Honda City and Toyota Corolla have already been sent to company A, then which of the following models of cars can be sent to company C?**

(1) Lancer
(2) Mondeo
(3) Baleno
(4) All of the above
(5) None of the above

22. **Which of the following models of cars cannot be sent to any of the three companies?**

(1) M800, Ikon, C-class, Wagon R
(2) Swift, Wagon R, C-class, Fiesta
(3) Swift, Alto, Fiesta, Baleno
(4) Zen, Santro, Wagon R, Fiesta
(5) Wagon R, Fiesta, Alto, Baleno

23. **How many different models of cars can be sent to more than one of the three companies?**

(1) 5
(2) 4
(3) 6
(4) 2
(5) 3

DIRECTIONS *for questions 24 to 27:* **Answer the questions on the basis of the information given below.**

At the finals of the "Gaana Sunao" contest, which was conducted all over India, five contestants - C_1, C_2, C_3, C_4 and C_5 - participated. Before the announcement of the results, six mischievous persons - Azad, Bose, Chand, Dev, Ehsaan and Fardeen - managed to get hold of the result sheet, which contained the scores of each of the five participants. Each of the six persons then decided to announce the sum of the final scores of exactly four contestants. So, Azad, Bose, Chand, Dev, Ehsaan and Fardeen announced their sums as 220, 260, 230, 240, 210 and 250 points respectively. However, one of them made a mistake in adding the scores. Also, the organizers of the contest decided to award an amount of Rs.10,000 for each point that a contestant scored. The score of each contestant is an integral value.

24. **What is the highest possible amount that any of the five contestants can be eligible for?**

(1) Rs.7 lakh
(2) Rs.7.5 lakh
(3) Rs.8 lakh
(4) Rs.8.5 lakh
(5) Rs.9 lakh

25. **If the exact scores of the contestants C_1, C_2, C_3, C_4 and C_5 are *a*, *b*, *c*, *d* and *e*, in no particular order, then how many of these five scores can be determined?**

(1) 0
(2) 1
(3) 2
(4) 3
(5) 4

26. **If one of the contestants is eligible for Rs.5 lakh, then what is the total amount that the organizers have to give away to all the five contestants put together?**

(1) Rs.30 lakh
(2) Rs.29.5 lakh
(3) Rs.29 lakh
(4) Rs.28.5 lakh
(5) Cannot be determined

DIRECTIONS *for questions 28 to 30:* **Answer the questions on the basis of the information given below.**

DETAILS OF STUDENTS OF FOUR COLLEGES

Name of the college	Number of boys as a percentage of number of girls passed	Percentage of boys	Percentage of students who passed	Number of students failed	Number of sportsper as a percentage of sportsmen
A	60%	50%	80%	200	$112\frac{1}{2}$%
B	75%	60%	60%	280	125%
C	100%	55%	70%	240	$133\frac{1}{3}$%
D	140%	60%	50%	300	100%

27.   If two of the contestants put together are eligible to receive exactly Rs.15 lakh, then who among the following could have made the mistake while adding the scores?

(1) Bose
(2) Chand
(3) Dev
(4) Ehsaan
(5) None of these

28.   For how many colleges is the number of students passing more than the average number of students passing from all the colleges?

(1) 0
(2) 1
(3) 2
(4) 3
(5) 4

29.   In which institute is the number of sportspersons the least?

(1) A
(2) C
(3) D
(4) B
(5) Cannot be determined

30.   In the college C, if there are 30 girls who are sportspersons, what percentage of the students are not sportspersons?

(1) 60%

(2) 75%

(3) 85%

(4) 80%

(5) Cannot be determined

DIRECTIONS *for questions 31 to 34:* **Answer the questions on the basis of the information given below.**

  The following table gives some financial details of twelve Indian companies.

Company	Sales (Rs.crore)	Expenditure (Rs.crore)	Other Income (Rs.crore)	Liquidity Ratio	Net Profit (Rs.crore)
A	5800	2790	380	1.40	350
B	5490	4790	920	1.75	450
C	6400	2680	1240	1.62	180
D	3800	2190	1350	1.48	950
E	7820	6230	740	1.80	1020
F	2100	1980	980	1.73	800
G	4500	4230	650	1.36	720
H	3420	2140	1020	1.44	850
I	6500	5460	1460	1.33	650
J	6200	5840	1100	1.40	480
K	3680	2200	940	1.75	525
L	4500	3680	1130	1.45	550

Each of the above twelve companies belongs to exactly one of the four sectors - Pharmaceuticals, Automobiles, Mobiles and Construction. It is also known that, there are at least two of the above twelve companies in each of the four sectors.

Further, it is also known that,

(i) for any two mobile companies X and Y, if sales of X are more than Y, the expenditure of X will be more than that of Y and the other income of X will be less than that of Y.

(ii) for any two automobile companies X and Y, if the expenditure of X is less than that of Y, the liquidity ratio of X will be more than that of Y.

(iii) for any two pharmaceutical companies X and Y, if the other

income of X is more than that of Y, the net profit of X is more than that of Y.

(iv) for any two construction companies X and Y, if the liquidity ratio of X is less than that of Y, the net profit of X is more than that of Y.

Further,
for every pharmaceutical company, the sales are more than Rs.5000 crore.
for every mobile company, the liquidity ratio is more than 1.6.
for every construction company, the other income is more than Rs.1000 crore.
for every automobile company, the net profit is more than Rs.700 crore

31. Which among the following must be a construction company?

(1) I
(2) D
(3) J
(4) C
(5) None of these

32. Which among the following cannot be a pharmaceutical company?

(1) A
(2) E
(3) B
(4) J
(5) None of these

33. If there are four companies in sector S, then S can be

(1) Only Pharmaceuticals
(2) Only Automobiles
(3) Only Pharmaceuticals or Mobiles
(4) Only Construction
(5) Only Pharmaceuticals, Mobiles and Construction

34. If all the four sectors have the same number of companies, then which of the following is true?

(1) B is a pharmaceutical company.
(2) F is a mobile company.
(3) I is a construction company.
(4) B is a construction company.
(5) None of these

DIRECTIONS *for questions 35 and 36:* **Answer the questions on the basis of the information given below.**

 Each of the eight students Akash, Balu, Chakri, Diren, Ehsaan, Fatima, Giri and Hari, is of a different height. All of them are standing in a row in the increasing order of their heights such that the shortest person is at the extreme left. Three of them are from 1st standard, three from 2nd standard and two from 3rd standard.

(i) Akash, the second tallest, is not from 1st standard and Balu, who is the fourth tallest is from 2nd standard.
(ii) Ehsaan is from 2nd standard but Chakri is not from 3rd standard.
(iii) Hari is taller than Giri but shorter than Balu, while Diren is shorter than Akash.
(iv) Chakri is shorter than Giri but taller than Fatima.
(v) Neither the shortest nor the second shortest is from 1st standard.

35.   Which two students from the same standard are adjacent to each other?

(1) Hari and Balu
(2) Balu and Giri
(3) Giri and Hari
(4) Chakri and Balu
(5) None of these

36.   Which of the following statements is definitely true?

(1) Each 2nd standard student is next to at least one 3rd standard student.
(2) Each 3rd standard student is next to at least one 2nd standard student.
(3) No two students of the same standard are adjacent to each other.
(4) All the above
(5) None of the above

DIRECTIONS *for questions 37 to 40:* **The questions given below are followed by two statements, I and II. Study the information given in**

the two statements and assess whether the statements are sufficient to answer the questions and choose the appropriate option from among the choices given below.

37.   In a class, the number of students who passed in both Physics and Chemistry is same as that who passed in neither Physics nor Chemistry. Find the difference between the number of students who passed in only Physics and those who passed in only Chemistry.
I. 100 students passed in Physics and 40 of them failed in Chemistry.
II. The number of students who failed in Chemistry is equal that who failed in Physics.

(1) Statement I alone is sufficient and statement II alone is not sufficient to answer the question.

(2) Statement II alone is sufficient and statement I alone is not sufficient to answer the question.

(3) Statements I and II together are sufficient but neither statement alone is sufficient to answer the question.

(4) Statement alone is sufficient to answer the question.

(5) Statements I and II together are not sufficient to answer the question and additional data, specific to the problem, is needed.

38.   The average marks scored by the students in a class is 75. What is the number of students in the class?
I. The highest and the lowest marks in the class are 95 and 55 respectively.
II. Exclusion of the students who scored the highest and the lowest marks does not change the average marks of the remaining students.

(1) Statement I alone is sufficient and statement II alone is not sufficient to answer the question.

(2) Statement II alone is sufficient and statement I alone is not sufficient to answer the question.

(3) Statements I and II together are sufficient but neither statement alone is sufficient to answer the question.

(4) Statement alone is sufficient to answer the question.

(5) Statements I and II together are not sufficient to answer the question and additional data, specific to the problem, is needed.

39.   A shepherd had 100 sheep which he used for breeding. The sheep were of two colours - white and brown and each sheep produced an offspring.

The offspring of a white sheep was always white or black while that of a brown sheep was white or brown. How many brown sheep were used for breeding?
I. The number of white offsprings were 50.
II. The number of brown offsprings were ten more than the black offsprings.

(1) Statement I alone is sufficient and statement II alone is not sufficient to answer the question.

(2) Statement II alone is sufficient and statement I alone is not sufficient to answer the question.

(3) Statements I and II together are sufficient but neither statement alone is sufficient to answer the question.

(4) Statement alone is sufficient to answer the question.

(5) Statements I and II together are not sufficient to answer the question and additional data, specific to the problem, is needed.

40. How many among the four players - A, B, C and D scored a century?
I. Ram said A and B scored centuries while Mohan said at least two among A, C and D scored centuries.
II. Ram always tell the truth while Mohan always lies.

(1) Statement I alone is sufficient and statement II alone is not sufficient to answer the question.

(2) Statement II alone is sufficient and statement I alone is not sufficient to answer the question.

(3) Statements I and II together are sufficient but neither statement alone is sufficient to answer the question.

(4) Statement alone is sufficient to answer the question.

(5) Statements I and II together are not sufficient to answer the question and additional data, specific to the problem, is needed.

Verbal Ability

DIRECTIONS *for questions 41 to 43:* In each question, there are five sentences. Each sentence has pairs of words/phrases that are italicised and highlighted. From the italicised and highlighted word(s)/phrase(s), select the most appropriate word(s)/phrase(s) to form correct sentences. Then, from the options given, choose the best one.

41. (i) According to media reports the accident *occurred* (A) / *happened* (B) at about 11:30 a.m.
(ii) Caution should be exercised while handling *electric* (A) / *electrical* (B) equipment.
(iii) Abdul is a carpenter by *trade* (A) / *profession* (B).
(iv) Apart from the brilliant storyline, the excellent sound and *light* (A) / *lighting* (B) effects of the movie made it worth watching.
(v) He produced a brilliant *feint* (A) / *faint* (B) and thrust the ball into the net.

(1) BABBA
(2) AABBA
(3) ABBAA
(4) ABABA
(5) BABAB

42. (i) The *rapid* (A) / *swift* (B) action taken by the local police in nabbing the notorious burglar was widely appreciated.
(ii) He categorically stated that no *further* (A) / *farther* (B) discussion would be entertained on the matter.
(iii) Today's women prefer a modern kitchen with all the latest *gadgets* (A) / *appliances* (B).
(iv) I am not *averse* (A) / *adverse* (B) to working extra hours.
(v) He vowed to *avenge* (A) / *revenge* (B) his sister's death.

(1) AAAAA
(2) AABAB
(3) BAAAA
(4) ABABA
(5) BABAA

43. (i) The *venal* (A) / *venial* (B) official's corrupt deeds were exposed by the media.
(ii) The *imminent* (A) / *eminent* (B) threat of a civil war looms large in the country.

(iii) Mahatma Gandhi was an *apostate* **(A) /** *apostle* **(B) of non-violence.**

(iv) John is a very *gregarious* **(A) /** *egregious* **(B) person, quite the opposite of his reclusive brother.**

(v) It is believed that the new government might *abnegate* **(A) /** *abrogate* **(B) the treaty.**

(1) AAAAA

(2) AAABA

(3) AABAB

(4) AAAAB

(5) BAAAA

DIRECTIONS *for questions 44 to 46:* **Read the following passage and answer the questions that follow it.**

Where does morality come from? The modern consensus on this question lies close to the position laid out by the eighteenth century Scottish philosopher David Hume. He thought moral reason to be "the slave of the passions". Hume's view is supported by studies that suggest that our judgements of good and evil are influenced by emotional reactions such as empathy and disgust. And it fits nicely with the discovery that a rudimentary moral sense is universal and emerges early. Babies as young as six months judge individuals on the way that they treat others and even one year olds engage in spontaneous altruism.

All this leaves little room for rational deliberation in shaping our moral outlook. Indeed, many psychologists think that the reasoned arguments we make about why we have certain beliefs are mostly post-hoc justifications for gut reactions. As the social psychologist Jonathan Haidt puts it, although we like to think of ourselves as judges, reasoning through cases according to deeply held principles, in reality we are more like lawyers, making arguments for positions that have already been established. This implies we have little conscious control over our sense of right and wrong.

I predict that this theory of morality will be proved wrong in its wholesale rejection of reason. Emotional responses alone cannot explain one of the most interesting aspects of human nature: that morals evolve. The extent of the average person's sympathies has grown substantially and continues to do so. Contemporary readers of 'Nature', for example, have different beliefs about the rights of women, racial minorities and homosexuals compared with readers in the late 1800s, and different intuitions about the morality of practices such as slavery, child labour and the abuse of animals for

public entertainment. Rational deliberation and debate have played a large part in this development.

Emotional and non-rational processes are plainly relevant to moral change. Indeed, one of the main drivers of moral change is human contact. When we associate with other people and share common goals, we extend to them our affection. Increases in travel and access to information as well as political and economic interdependence mean that we associate with many more people than our grandparents and even our parents. As our social circle widens, so does our 'moral circle'.

But this 'contact hypothesis' explanation is limited. It doesn't explain the shifts in opinions on issues such as slavery and animal rights. Contact cannot explain the birth of new moral ideas, such as the immorality of sexism or the value of democracy. It doesn't account for how our moral attitudes can change towards those with whom we never directly associate, for example, why some of us give money and even blood to people with whom we have no contact and little in common. There have been attempts to explain such long distance charity through mechanisms such as indirect reciprocity and sexual selection, which suggest that individuals gain reproductive benefit from building a reputation for being good or helpful. But this begs the question of why such acts are now seen as good when they were not in the past.

What is missing, I believe, is an understanding of the role of deliberate persuasion. Language is an effective tool for motivating sympathy towards others. For example, Harriet Beecher Stowe's 1852 novel Uncle Tom's Cabin helped to end slavery in the United States, and descriptions of animal suffering in Peter Singer's Animal Liberation (1975) and elsewhere have been powerful catalysts for the animal rights movement. Stories can be morally corrosive too: if we are encouraged to imagine people doing things that anger or disgust us, we are quick to evict them from our moral circle. Examples of this are all too familiar, such as Adolf Hitler's propaganda against the Jews in Nazi Germany, or the negative depictions of homosexuals put out by anti-gay campaigners in many countries today.

Stories emerge because people arrive at certain views and strive to convey them to others. It is this generative capacity that contemporary psychologists have typically ignored. Moral psychology in particular focuses nearly exclusively on studies in which volunteers are exposed to artificial moral dilemmas that have been thought up by other people, such as situations in which one must choose whether to kill one person to save five.

Proponents of the view that we are prisoners of our emotions might

argue that moral deliberation and creativity are rare, perhaps restricted to people who spend their lives thinking about these issues, such as theologians and philosophers. Yet most people are regularly forced to ponder dilemmas such as the proper balance of work and family. Even though few of us write novels or produce films, humans are natural storytellers, and use narrative to influence others, particularly their own children.

It would be a mistake as scientists - and as politically and socially engaged citizens - to dismiss the importance of this reflective process in shaping our morality and, consequently, world in which we live. Research might focus more on how children and adults deal with everyday moral problems, looking closely at cases in which their judgements diverge from those of people around them. Examples of work in this area include the studies by Robert Coles, a child psychiatrist at Harvard University in Cambridge, Massachusetts, on how black and white children dealt with racial desegregation and forced school integration during the U.S. civil rights movement, and the ongoing research by the psychologists Karen Hussar and Paul Harris at the Harvard Graduate School of Education on why some children raised in non vegetarian households choose not to eat meat.

Psychologists have correctly emphasized that moral views make their impact by being translated into emotion. A complete theory must explain where these views come from in the first place.

44. The question raised at the beginning of the passage

(1) poses a dilemma to the author and the readers alike.

(2) is relevant only to philosophers and theologians

(3) becomes irrelevant by the end of the passage.

(4) has been analysed by the author but there appears to be no answer to it yet.

(5) has been given several and conflicting answers in the passage.

45. All of the following can be attributed to the author EXCEPT:

(1) Morality is instinctive but we seek to rationalize our position.

(2) That morals change is evidence of the influence of reason.

(3) The traditional views regarding morals offer no scope for a rational analysis.

(4) Our views regarding races, gender and discrimination have changed for the better over time.

(5) Both reason and sentiments affect our moral viewpoint.

46. The contact hypothesis
A. explains why acts that were not considered good are now regarded highly.
B. finds self interest to be at the core of altruism and apparently selfless behaviour.
C. fails to explain the changes in moral outlook over a period of time.
D. accounts for changed perceptions regarding slavery, animal rights etc.
E. fails to account for altruism and selfless behaviour towards strangers.

(1) A and D
(2) B and E
(3) C and E
(4) A and C
(5) B and D

DIRECTIONS *for questions 47 to 49:* **In each of the following questions, the word at the top is used in five different ways, numbered 1 to 5. Choose the option in which the usage of the word is INCORRECT or INAPPROPRIATE.**

47.   AIR

(1) Open the windows and let the fresh air in.
(2) It takes two hours by air to reach Chennai from Hyderabad.
(3) The appetizing aroma wafting through air stirred up our appetite.
(4) Her colleagues resent her as she always puts on airs.
(5) The management never gives an opportunity to the employees to air their grievances.

48. BACK

(1) He intends to purchase a house in a non-descript village in the back of beyond.
(2) As she hurt her back falling off a horse, she was advised bed rest for a couple of weeks.
(3) A true friend never turns his back from you when you need his help.
(4) We decided to keep the plan on the back burner due to paucity of funds.
(5) She is not the sort to back away from responsibilities.

49. GET

(1) She is forever under the impression that everybody is out to get him.

(2) You must get into the habit of maintaining a record of the money spent.

(3) He is finding it difficult to get by on his meagre income.

(4) He managed to get round his father to give him some extra pocket money.

(5) The students were eagerly waiting to get over the exams.

DIRECTIONS *for questions 50 to 52:* **Read the following passage and answer the questions that follow it.**

"Listen, Jeff, please, and try to understand," veteran Senator Joseph Paine implores newbie Jefferson Smith, pleading with him to go along with Capitol Hill business as usual in that classic Hollywood fable of principle versus practicality and perniciousness, *Mr. Smith Goes to Washington* (1939).

"This is a man's world, Jeff," explains Paine, "and you've got to check your ideals outside the door, like you do your rubbers. Thirty years ago, I had your ideas. I was you. I had to make the same decision you were asked to make today. And I made it. I compromised."

Would Barack Obama, 20 years from now, be giving that talk if he hadn't won a quick promotion? Or would Obama be the kindly president of the Senate in Frank Capra's tale who encourages young Smith to stick to his principles with a smile of solidarity here, a helpful ruling there? Hard to say, just as almost everything connected to the concept of "compromise" threatens philosophical confusion.

Is compromise a good or bad thing? Imagine trying to teach a young person whether the word "compromise" is positive or negative. Would you point to the cascade of newspaper editorials bemoaning how Republicans and Democrats can't cooperate on health care? Seems it's a positive word. What about the editorials suggesting that the demand for high integrity among public officials can't be weakened, the rights of so-called enemy defendants before U.S. courts can't be narrowed, the just entitlements of occupied people can't be denied? Seems it's a negative word. Certainly it drives one back to fundamental political and moral beliefs, one's bedrock sense, as Senator Paine says, of how "things are."

The dictionaries tell us that "compromise" etymologically arises from the notion of mutual promising, an act of cooperation, though that sense now registers as "obsolete" or "archaic." Its primary contemporary meaning as a noun is "a settlement of differences in which each side makes concessions" *(American Heritage)*, an "adjustment of opposing principles, systems, etc., by modifying some aspects of each" *(Webster's New World)*. That sounds neutral, or even presumptively positive, on the logical assumption that any agreement, by definition, satisfies both parties. Yet pejorative senses-"a concession to something detrimental," "a weakening, as of one's principles"-follow right afterward.

We find the same split in the collected wisdom of the centuries. On the positive side, no less than conservative icon Edmund Burke famously declared, in his *Speech on Conciliation With America* (1775), that "All government-indeed every human benefit and enjoyment, every virtue and every prudent act-is founded on compromise and barter." Eleanor Roosevelt, hardly a direct ideological descendant of Burke, shared that spirit ("All big things in human history have been arrived at slowly and through many compromises"), as did a loyal Republican named Dwight Eisenhower ("Things are not all black and white. There have to be compromises. The middle of the road is all of the usable surface. The extremes, right and left, are in the gutters.").

Yet the strain of condescension and condemnation toward compromise also boasts a long lineage. "Compromise makes a good umbrella but a poor roof," observed 19th-century poet and editor James Russell Lowell, adding that it amounted to a "temporary expedient, often wise in party politics, almost sure to be unwise in statesmanship." Andrew Carnegie thought: "The 'morality of compromise' sounds contradictory. Compromise is usually a sign of weakness, or an admission of defeat. Strong men don't compromise ... and principles should never be compromised." German novelist Günter Grass voiced the familiar idea in aesthetics that artists do as they please in their work: "Art is uncompromising and life is full of compromises."

The conflict on compromise plays out especially in American political history. Was the "Great Compromise of 1787," which settled the battle over representation between large and small states while also preserving slavery, a triumph that enabled the fledgling United States to survive, or an embarrassment that ensured its moral shame until emancipation? Charles Sumner, the intrepid 19th-century antislavery senator from Massachusetts whose rigidity about "principles" makes Jim Bunning seem like a wimp, complained that "from the beginning of our history, the country has been afflicted with compromise. It is by compromise that human rights have been abandoned." Abolitionist William Lloyd Garrison

declared, "I will be as harsh as truth, and as uncompromising as justice." To Frederick Douglass, the semantics of compromise was clear: "The opposite of compromise is character."

50. Which of the following ideas have been suggested in the passage?
A. The concept of compromise is as perplexing as the meaning of the word compromise.
B. To compromise is easier said than done.
C. The conflict on compromise stems from the etymological confusion that surrounds it.
D. It is neither easy to explain the meaning of the term compromise nor to decide if and when to compromise.

(1) Only A and C
(2) Only A, B and C
(3) Only B and C
(4) Only A and D
(5) A, B, C, and D

51. Edmund Burke, Roosevelt and Eisenhower, it can be understood, from the passage,

(1) saw political merit in following a middle path.
(2) associated the concept of compromise with conventional wisdom.
(3) supported compromise because it made political sense.
(4) held divergent views on the subject of compromise.
(5) viewed compromise in favourable light.

52. With respect to health care, the passage suggests that the print media is extremely disappointed with the Democrats and Republicans for

(1) throwing their ideologies to the wind.
(2) compromising on their principles.
(3) sticking to their guns.
(4) not adopting a conciliatory approach.
(5) making an issue over non-issues.

53. The sustainability of human beings and other living creatures on our planet depends largely and solely on the availability of water. Though our planet is filled with more than 70 percent of water, only 2.7 percent of it is fresh water. This shows the scarce availability of

fresh water for human use. Despite that, due to excessive exploitation of ground water, and the increasing pollution of fresh water resources we are at the brink of a global water crisis.

(1) Global warming and climate change would have a debilitating impact on the existing water resources affecting millions of people throughout the world.

(2) Still our society, the members of which value technology more than the natural resources have turned a blind eye to this diminishing source of life.

(3) Needless to say, it is high time to regulate the unrestrained exploitation of ground water and make water conservation a must in all parts of the country.

(4) Throughout the country people of different states have devised their own ways for conserving water.

(5) Conservation of this important natural resource is not something that requires huge planning or involves staggering costs.

54.   When justice is denied by a society, including a socialist, secular and democratic one as in India, expectations darken into depression. Then that depression turns into dread, dread transforms itself into despair and despair evolves into explosive terrorism. State violence as an instrument to suppress terrorism is futile. After a time the bitterness and revengefulness that is generated will seek to overthrow those very forces that control state power - call it fascism, naxalism, Maoism or whatever.

(1) When the rule of the robes proves a mirage, the rule of robbery gets support and sanction.

(2) The dangerous deterioration of democracy into bedlam terrorism is hastened when access to justice ceases to be a reality.

(3) The system of justice, justices and justicing must be made truly accessible to the have-nots by means of radical judicial reform.

(4) Humanism is what we need if noxious, nascent violence is to surrender to truth.

(5) A revolution is necessary and a sense of scientific spirit and reason is needed if the judicature is not to become a caricature.

55.   When a mistake happens some of us instead of accepting it or trying to find out the reasons, try and justify it by saying it is not our fault or the conditions were beyond our control or that an error was bound to occur. We even justify our actions as the best way the situation could have been handled. This kind of justification blocks our thinking on better ways we could have dealt with the situation or be receptive to alternative ideas from others.

(1) Some of us are prone to believing that we keep making the same mistakes because of a personality flaw.

(2) Believing that our action was totally reasonable prevents any learning from the mistake.

(3) Hence we must avoid such justifications because every mistake provides a learning experience.

(4) Mistakes often occur due to the tendency to rush things and the need to conform to a culture that appreciates speed.

(5) Though we vow to learn from the mistakes, most of the times we find ourselves making more mistakes or repeating the same ones.

DIRECTIONS *for questions 56 to 58:* Read the following passage and answer the questions that follow it.

It was a tragedy of errors. Fourteen-year-old Matilda Crabtree was just playing a practical joke on her father: she jumped out of a closet and yelled "Boo!" as her parents came home at one in the morning from visiting friends.

But Bobby Crabtree and his wife thought Matilda was staying with friends that night. Hearing noises as he entered the house, Crabtree reached for his 357 caliber pistol and went into Matilda's bedroom to investigate. When his daughter jumped from the closet, Crabtree shot her in the neck. Matilda Crabtree died twelve hours later.

One emotional legacy of evolution is the fear that mobilizes us to protect our family from danger; that impulse impelled Bobby Crabtree to get his gun and search his house for the intruder he thought was prowling there. Fear primed Crabtree to shoot before he could fully register what he was shooting at, even before he could recognize his daughter's voice. Automatic reactions of this sort have become etched in our nervous system, evolutionary biologists presume, because for a long and crucial period in human prehistory they made the difference between survival and death. Even more important, they mattered for the main task of evolution: being able to bear progeny who would carry on these very genetic predispositions - a sad irony, given the tragedy at the Crabtree household.

But while our emotions have been wise guides in the evolutionary long run, the new realities civilization presents have arisen with such rapidity that the slow march of evolution cannot keep up. Indeed, the first laws and proclamations of ethics - the Code of Hammurabi, the Ten Commandments of the Hebrews, the Edicts of Emperor Ashoka - can be read as attempts to harness, subdue, and domesticate emotional life. As Freud described in Civilization and

Its Discontents, society has had to enforce from without rules meant to subdue tides of emotional excess that surge too freely within.

Despite these social constraints, passions overwhelm reason time and again. This given of human nature arises from the basic architecture of mental life. In terms of biological design for the basic neutral circuitry of emotion, what we are born with is what worked best for the last 50,000 human generations, not the last 500 generations - and certainly not the last five. The slow, deliberate forces of evolution that have shaped our emotions have done their work over the course of a million years; that last 10,000 years - despite having witnessed the rapid rise of human civilization and the explosion of the human population from five million to five billion - have left little imprint on our biological templates for emotional life.

For better or for worse, our appraisal of every personal encounter and our responses to it are shaped not just by our rational judgements or our personal history, but also by our distant ancestral past. This leaves us with sometimes tragic propensities, as witness the sad events at the Crabtree household. In short, we too often confront post-modern dilemmas with an emotional repertoire tailored to the urgencies of the Pleistocene. That predicament is at the heart of my subject.

A view of human nature that ignores the power of emotions is sadly short-sighted. The very name *Homo sapiens*, the thinking species, is misleading in light of the new appreciation and vision of the place of emotions in our lives that science now offers. As we all know from experience, when it comes to shaping our decisions and our actions, feeling counts every bit as much - and often more - than thought. We have gone too far in emphasizing the value and import the purely rational - of what IQ measures - in human life. Intelligence can come to nothing when the emotions hold sway.

56.   Our interactions and reactions in daily life, according to the passage,

(1) are not guided by rationale.
(2) are not influenced by individual experiences.
(3) have more to do with our evolutionary roots.
(4) are all of the above.
(5) are none of the above.

57. How does the passage explain Bobby Crabtree's action?

(1) A fear that is characteristic of the human psyche.

(2) A spontaneous defence mechanism which is a legacy of evolution.

(3) An instance of heart ruling the head.

(4) The emotional instinct of all creatures to protect their offspring.

(5) The impulsive nature of all species.

58. Which of the following ideas is NOT suggested in the passage?

(1) Emotions which helped us in our battle for survival have become outdated.

(2) Forces of evolution have shaped our emotions over a long period of time.

(3) Laws were framed to tame our emotional highs.

(4) Emotions which served us in the early ages have misfired in modern-day conflicts.

(5) Emotions tend to overpower our intellect.

DIRECTIONS *for questions 59 and 60:* **In each question, there are five sentences/paragraphs. The sentence/ paragraph labelled A is in its correct place. The four that follow are labelled B, C, D and E, and need to be arranged in the logical order to form a coherent paragraph/passage. From the given options, choose the most appropriate option.**

59. A. The recent announcement by the World Health Organization that no serious and unexpected adverse effects have been seen in the nearly 65 million people who have been vaccinated for the 2009 influenza (H1N1) in 16 countries is encouraging.
B. The vaccine was seen as a new and experimental drug hurried along in fast track mode tested on small number of volunteers and followed up for an inadequate duration.
C. Reports from following up millions of people after vaccination have now put at rest the safety concerns.
D. Apprehensions about the vaccine's safety were raised by the medical fraternity in a few countries and parents were unwilling to get their children vaccinated.
E. Though fast tracking flu vaccines is routine as the basic ingredients remain the same, a frontal objection was raised by the New England Journal of Medicine in an editorial: "any association of uncommon adverse events with this vaccine cannot be ascertained in studies of this size".

(1) DEBC

(2) BDEC

(3) DBEC

(4) BEDC

(5) CDBE

60.   A. South Asia is perhaps the most difficult place in the world. It is the epicentre of terrorism. It's also the epicentre of Maoism.
B. India is seen as a friend by countries which take the same path of democracy, secularism, pluralism and inclusive growth. India is also seen as a threat by some countries.
C. Seen from a strategic point of view, India holds the key to political and economic stability in south Asia, and our responsibility is great because our democratic and secular credentials are underpinned by the steady-progress in the socio-economic sectors.
D. It, therefore, falls upon India to disprove the tag of a threat to any neighbour and send a message that it is ready to become the engine of change and the leader of economic development in the region.
**E. Being the largest country in South Asia largest in terms of size, population, as well as the size of the economy all countries in South Asia look to India either as a friend or as a foe.**

(1) EBCD

(2) DBCE

(3) CEBD

(4) ECBD

(5) CBED

SOLUTIONS

Quantitative Ability

1. Let them meet at 'x' m from the start, after, say time 't'.
   Let their speeds be r and s
   $r = 2s$ (initially)
   Later $r = s/2$
   $$\frac{x-50}{s/2} + \frac{50}{2s} = \frac{x}{s} \Rightarrow x = 75 \text{ m}$$
   ∴ If it is a 100 m race, then Somu will catch Ramu at $100 - 75 = 25$ m from the finishing line. Choice (2)

2. The graphs of $y = 10^x$ and $xy = 1$ are shown below and $y = 10^x$ intersects y-axis at $y = 1$.
   Also if $P(x, y)$ is the point of intersection of the curves then $y = 10^{1/y}$ (substituting value of x from $xy = 1$).
   $\Rightarrow y^y = 10$
   Given that $y \geq 2$, we need to see if the solution for $y^y = 10$ gives us a root for y which is greater than or equal to 2.
   Now by simple observation since $2^2 < 10 < 3^3$, $2 < y < 3$
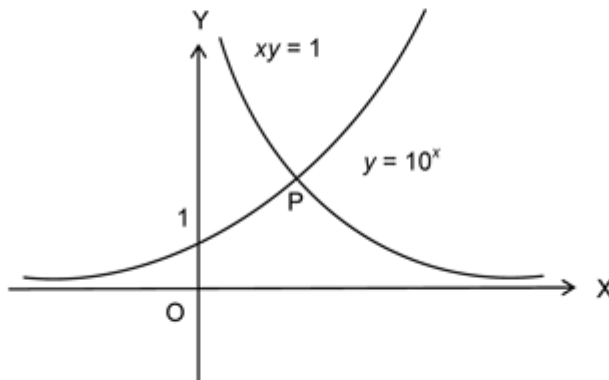
   Hence, we see that the curves intersect at only one point where $y \geq 2$. Choice (2)

   Note : Though the graph of $xy = 1$ lies in both the first and the third quadrants, only the first quadrant is relevant, since $y \geq 2$.

3. Let the two digit numbers be $10a + b$ and $10c + d$
∴ $p = (10a + b)(10c + d) = (10b + a)(10d + c)$
$100ac + 10ad + 10bc + bd = 100bd + 10bc + 10ad + 10ac$
$99ac = 99bd$
$ac = bd$
It is known that ac is prime. Whenever the product of two whole numbers is prime, one of them must be 1 and the other must be the prime number.
As product of a and c is prime, one of them must be one. The other digit must be prime.
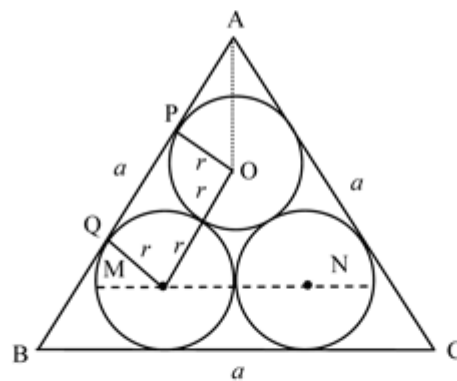∴ The other digit could be 2 or 3 or 5 or 7.
∴ $ac = bd = 2$ or 3 or 5 or 7.
bd must also have one digit as prime and the other digit as 2 or 3 or 5 or 7.
The possible products of (ab) and (cd) are (11) (22), (12) (21), (11) (33), (13) (31), (11) (55), (15) (51), (11) (77) and (17) (71) i.e., 242, 252, 363, 403, 605, 765, 847 and 1207.
Therefore the sum of all possible products = 4684. Choice (4)

4.

Consider MN = $4r <$ BC $\Rightarrow r < \dfrac{a}{4}$. Hence, we need to look for the choice were the denominator is greater than 4. Only choice (1) is possible.

Alternative solution:

Let the radius of the circle be r.
In the figure given above, PQ = $2r$

In $\triangle APO$, $\tan\angle PAO = \tan 30° = \dfrac{r}{AP} = \dfrac{1}{\sqrt{3}}$

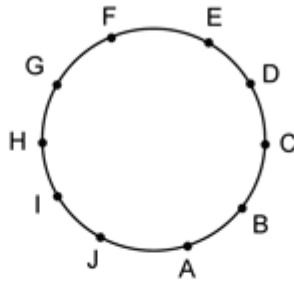$\Rightarrow AP = \sqrt{3}r$
Similarly, BQ = $\sqrt{3}r$

∴$a = \sqrt{3}r + 2r + \sqrt{3}r \Rightarrow r = \dfrac{a}{2(\sqrt{3}+1)}$ Choice (1)

5. For the sake of understanding, first consider only 10 points.
Let A, B, C, D, E, F, G, H, I and J be the given points.

The regular polygons that can be formed by using the given points are:
The decagon ABCDEFGHIJ and the two pentagons ACEGI, BDFHG.
i.e. 3 regular polygons can be drawn.
i.e., polygon of 10 sides = 1 polygon. (= 10 ÷ 10)
Polygon of 5 sides = 2 polygons. (= 10 ÷ 5)
Now for 36 points, the number of polygons of various number of sides will be

No. of sides	No. of distinct regular polygons
3	12 = (36 ÷ 3)
4	9
6	6
9	4
12	3
18	2
36	1

Hence a total of 12 + 9 + 6 + 4 + 3 + 2 + 1 = 37.   Choice (3)

6. Observing the pattern of choices, we first consider and evaluate $3l$, $2m$ and $7n$.
$3l = 3a + 9b - 12c \quad \rightarrow (1)$
$2m = 4a - 2b - 2c \quad \rightarrow (2)$
$7n = 7a + 7b - 14c \quad \rightarrow (3)$
From (1), (2) and (3), by observing the coefficient of a, we can say that
$(1) + (2) - (3) = 0$
∴ $3l + 2m - 7n = 0$ Choice (3)

7. The n terms are distributed into 8 sub-series. If a sub-series has an odd number of terms, the average of the sub-series would be a term of the same sub-series. If it has an even number of terms, the average would not be a term of the sub-series. As the average lies in the same sub-series for 3 of the 8 sub-series the number of terms, i.e., n has to be of the form 'An even multiple of 8 ± 3' i.e., $16k \pm 3$ where k is a natural number.
Among the given choices, only 51 is a possible value.   Choice (5)

8. Let $2x^2 + 3y^2 - 4x - 12y + 18$ be denoted by E.
$E = 2(x^2 - 2x) + 3(y^2 - 4y) + 18$
$= 2(x -1)^2 + 3 (y - 2)^2 + (18 - 2 - 12) = 2(x -1)^2 + 3(y - 2)^2 + 4$
Since the minimum value of $(x - 1)^2$ and $(y - 2)^2$ is independently 0 each, the minimum value of E is 0 + 0 + 4 = 4.   Choice (3)

9. If a soldier has to distribute a certain number of coins among say 'n' peasants such that each peasant gets n coins, the number of coins with him or her has to be a perfect square. Perfect squares leave a remainder of 0 or 1 when divided by 4. However, all the numbers in given sequence (i.e., of the form $3 + 4k$) leave a remainder of 3. Thus, there were no soldiers who could distribute their coins. Hence zero peasants received at least one gold coin.   Choice (5)

10. Though we do not know the distance PQ along the track, we can observe that the time interval that is relevant is from 9:00 a.m. to 10:30 a.m., within which Arjun and Bhim covered the entire track-length once, travelling in opposite directions. Also, later, Arjun took 75 minutes more than Bhim to complete one full track-length (and return to O).

Let the length of the track be L meters and the speeds of Arjun and Bhim be p and q m/s respectively.

Together, the two cover the entire track in 90 minutes

i.e. $L = 90(p + q)$ ------- (1)

Arjun takes 75 minutes more than Bhim to cover the entire track

i.e. $\dfrac{L}{p} = \dfrac{L}{q} + 75$ ------- (2)

Since $L = 90(p + q)$

$\dfrac{90(p+q)}{p} = \dfrac{90(p+q)}{q} + 75$

$\Rightarrow \dfrac{q}{p} - \dfrac{p}{q} = \dfrac{5}{6}$ ------- (3)
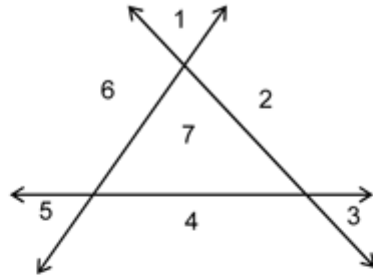
Checking for $p : q$ from choices, $p : q = 2 : 3$ satisfies.   Choice (2)

Note : Alternately (3) can be assumed to be of the form $\dfrac{1}{r} - r = \dfrac{5}{6}$ and solved to give

$r = \dfrac{-3}{2}$ or $\dfrac{2}{3}$. Since r is positive $r = \dfrac{2}{3}$.

11. In case of three lines the following possibilities occur:
(i) No two lines are parallel and the lines are not concurrent, in this case the plane gets divided into 7 regions.
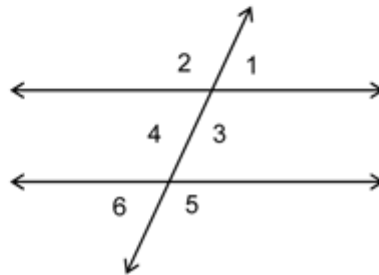

(ii) The three lines are concurrent, in this case the plane gets divided into 6 regions.
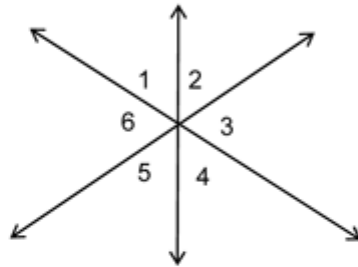
(iii) The lines are parallel, in this case we get 4 regions.

(iv) In case two lines are parallel, and the third line acts as a transversal, we get a total of 6 regions.

So, three lines can divide the plane into 4, 6 or 7 regions but not 5 regions.

Choice (3)

12. Initial sum of the 20 numbers in P = 20 × 20 = 400
Now when a_i is added from Q to P, average of the numbers in P becomes 20 + (2).
When a_2 is added, average of P becomes 20 + (2 + 3) and so on
⇒ final average of the numbers of P i.e. when a_{20} is added

$= 20 + (2 + 3 + \ldots 21) = 20 + \left(\frac{21+2}{2}\right) \times 20 = 250$

Hence, the final sum of the 40 numbers in P = 250 × 40 = 10,000
⇒ Sum of $a_1 + a_2 + a_3 \ldots\ldots\ldots a_{20}$ = 10,000 − 400 = 9,600
⇒ Average of $a_1, a_2, a_3 \ldots a_{20}$ = $\frac{9,600}{20}$ = 480

Choice (3)

13. Let the three numbers be $3a$, $3b$ and $3c$. As HCF $(3a, 3b)$
= HCF $(3b, 3c)$ = HCF$(3a, 3c)$ = 3
$\Rightarrow$ The LCM of the three numbers = $3abc$
The product of the numbers = $27abc = 9(3abc) = 1620$
$\therefore 3abc = \dfrac{1620}{9} = 180$
$\therefore$ The LCM of the three numbers is 180.   Choice (1)

14. Every ant eats (or tries to eat) every 5th beetle that it comes across.
$\therefore$ The first ant eats the 5th beetle.
The second ant eats the 6th beetle, (which is the 5th beetle it comes across).
The third ant would try to eat the 7th beetle (if it survives until then, but it would have been eaten up by the 1st beetle itself)

Every beetle eats every 3rd ant that it comes across.
$\therefore$ The first beetle eats the 3rd ant.
The second beetle eats the 4th ant (which will be the third ant it comes across).
The third beetle eats the 5th ant (which will be the third ant it comes across).
Finally only the first two ants survive by the time the seventh beetle passes and the first four beetles and some other beetles survive.

The first ant would eat beetle numbers 5, 10, 15, 20 and 25.
The second ant would eat beetle numbers 6, 12, 18, 24.
Total number of beetles that survive is 27-9 i.e. 18 and the number of ants that survive is 2.
$\therefore$ Total number of survivors is 20.   Choice (4)

15. Every ant eats (or tries to eat) every 5th beetle that it comes across.
$\therefore$ The first ant eats the 5th beetle.
The second ant eats the 6th beetle, (which is the 5th beetle it comes across).
The third ant would try to eat the 7th beetle (if it survives until then, but it would have been eaten up by the 1st beetle itself)

Every beetle eats every 3rd ant that it comes across.
$\therefore$ The first beetle eats the 3rd ant.
The second beetle eats the 4th ant (which will be the third ant it comes across).
The third beetle eats the 5th ant (which will be the third ant it comes across).
Finally only the first two ants survive by the time the seventh beetle passes and the first four beetles and some other beetles survive.

From the above solution, the number of beetles that have been eaten are 9. For the beetles eaten up to be the same as that of ants (i.e., 11) 2 more beetles should have been eaten.
We know that 30th beetle will be eaten by the first ant and 31st beetle will be eaten by the 2nd ant; (Now, the total casualties of beetles are 11).
$\therefore$ Minimum size of the beetle file is 31.   Choice (4)

16. Consider only four adjacent spheres in a single layer with a fifth sphere atop these four spheres. The fifth sphere touches each of the bottom four spheres in a symmetrical manner and even the bottom spheres touch exactly three spheres each, (i.e., two adjacent ones in the same layer and the one on top).

Now, if we consider the five centres of the five spheres, it can be easily observed that the four centres in the bottom layer form a square (at a height of r (radius) from the ground/bottom of the box). The fifth centre is symmetrically situated at some height above the plane of the square formed by the four centres below it. Infact, these five centres form the vertices of a square pyramid of side of the base as $2r$.

The centres can be visualised in the form of the pyramid shown below.
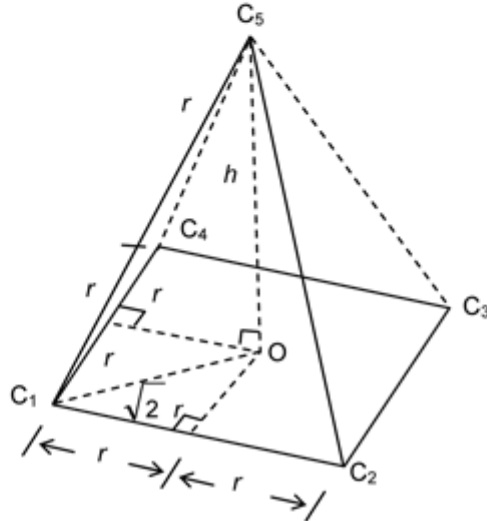
If the height of this pyramid = h, then in $\Delta C_1 O C_5$ $h = O C_5$

$$= \sqrt{(C_1 C_5)^2 - (C_1 O)^2} = \sqrt{(2r)^2 - \left(\sqrt{2}\,r\right)^2} = \sqrt{2}\,r$$

Now the side-view of the arrangement of spheres in the box, by Euclid, is shown below.
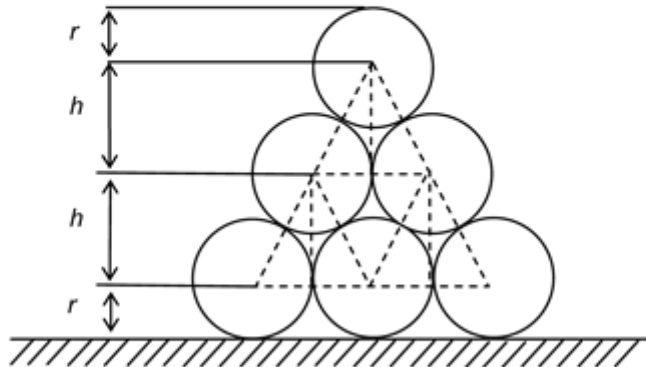
Hence the height of box 'H' = $r + h + h + r = 2(r + h)$

$$\Rightarrow H = 2(r + \sqrt{2}\,r) = 2r(\sqrt{2} + 1) \Rightarrow \frac{H}{r} = 2(\sqrt{2} + 1)$$ Choice (2)

17. Let the minimum number of varieties be n. Now, we have to select 3 fruits from these n. We have to choose n such that the number of selections (i.e., combinations of three out of n fruits) should be greater than (or) equal to the number of days, i.e., 31 + 28 = 59.

i.e., $^nC_3 \geq 59$

for $n = 8$

$^8C_3 = \dfrac{(8)(7)(6)}{6} = 56 < 59$

So minimum possible n is 9.   Choice (1)

18.
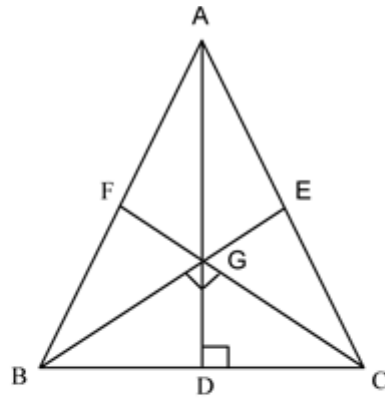
Given that, AB = AC and BC = 6 cm.
Let AD be the median drawn to BC and let 'G' be the centroid. Moreover, BE $\perp$ CF.
$\therefore$ $\triangle$GBC is right angled at 'G'.
GD $\perp$ BC
Moreover, from symmetry, $\triangle$BGD and $\triangle$GDC are identical.
$\Rightarrow$ BD = DC = 3 cm and $\angle$GCD = 45°
$\Rightarrow$ GD = DC = 3 cm
$\Rightarrow$ AD = 9 cm (G is the centroid)
In right-angled triangle ADC,
$$AC = \sqrt{(AD)^2 + (CD)^2} = \sqrt{81+9} = \sqrt{90} = 3\sqrt{10} \text{ cm}$$

Choice (1)

19. MS: Pipes A and B together can fill the tank in 24 minutes

Consider statement A with MS:

Since A alone can fill the tank in 40 minutes, B alone can fill the tank in $\dfrac{1}{\dfrac{1}{24} - \dfrac{1}{40}}$ i.e.

60 minutes. Since, with the given data no unacceptable values are obtained, statement A is not inconsistent with MS.

Consider the statement B with MS:
If A and B together fill a tank in 24 minutes, when operating alternately for a minute each, they take at most 48 minutes to fill the tank (irrespective of which is opened in the first minute).
So, B is inconsistent with statement MS.

Choice (1)

20. Let the cost of a pen, an eraser and a sharpener be Rs.P, Rs.E and Rs.S respectively.
According to the main statement,
3P + 4E + 5S = 54   –   (1)

Considering MS with statement A:
4P + 4E + 6S = 64   –   (2)
(2) – (1), gives P + S = 10 Let P = 5 and S = 5 then
E = 3.5. Hence, statement A is not inconsistent with MS.

Considering MS with statement B:
2P + 3E + 5S = 47   –   (3)
(1) – (3), gives P + E = 7 Let P = 4 and E = 3 then
S = 6. Hence MS is not inconsistent with statement B.

Considering the statements A and B together
2 x (3) – (2), gives 2E + 4S = 30
$\Rightarrow$ E + 2S = 15 Let E = 5 and S = 5 then P = 3.5
Hence A and B are also not inconsistent with each other.

Choice (3)

Logical & Data Interpretation

21. The different models which can be sent to the companies are

Company A	Company B	Company C
Ikon	M800	City
City	Zen	Corolla
Optra	Santro	Lancer
Corolla	Octavia	Mondeo
Accord	Alto	Baleno
Camry		
E-class		
Vectra		
Mondeo		

The cars which can be sent to company C are City, Corolla, Lancer, Mondeo and Baleno. So, as City and Corolla are sent to company A, any of the remaining cars can be sent to company C.   Choice (4)

22. The different models which can be sent to the companies are

Company A	Company B	Company C
Ikon	M800	City
City	Zen	Corolla
Optra	Santro	Lancer
Corolla	Octavia	Mondeo
Accord	Alto	Baleno
Camry		
E-class		
Vectra		
Mondeo		

Swift, Wagon R, C-class and Fiesta cannot be sent to any of A, B or C.   Choice (2)

23. The different models which can be sent to the companies are

Company A	Company B	Company C
Ikon	M800	City
City	Zen	Corolla
Optra	Santro	Lancer
Corolla	Octavia	Mondeo
Accord	Alto	Baleno
Camry		
E-class		
Vectra		
Mondeo		

Only Honda City, Toyota Corolla and Ford Mondeo can be sent to more than one company.   Choice (5)

24. Let us refer to each person by the first letter of his name.

First, let us find the possible scores of the contestants.

As the values given by five persons are correct, the sum of the values of these five people will be the sum of the five contestants score multiplied by 4. [because each got a different sum]

Let us add all the values given by the six persons.

$\Rightarrow 220 + 260 + 230 + 240 + 210 + 250 = 1410.$

Assume A made the mistake. So, $1410 - 220 = 1190$

Then, the sum of the five contestants = $\dfrac{1190}{4}$ = 297.5 which is not possible.

Assume B made the mistake. So, $1410 - 260 = 1150$

Then the sum of the five contestants = $\dfrac{1150}{4}$ = 287.5 which is not possible.

Assume C made the mistake. So, $1410 - 230 = 1180$

Then the sum of the five contestants = $\dfrac{1180}{4}$ = 295

Now, the possible scores are

$295 - 210 = 85$, $295 - 220 = 75$, $295 - 240 = 55$, $295 - 250 = 45$ and $295 - 260 = 35$.

Assume D made the mistake. So, $1410 - 240 = 1170$.

Then the sum of the five contestants = $\dfrac{1170}{4}$ = 292.5 which is not possible.

Assume E made the mistake. So, $1410 - 210 = 1200$

Then, the sum of the five contestant = $\dfrac{1200}{4}$ = 300.

Now, the possible scores are $300 - 220 = 80$,

$300 - 230 = 70$, $300 - 240 = 60$, $300 - 250 = 50$ and $300 - 260 = 40$

Assume F made a mistake. So, $1410 - 250 = 1160$

Then the sum of the five contestants = $\dfrac{1160}{4}$ = 290

Now, the possible scores are

$290 - 210 = 80$, $290 - 220 = 70$, $290 - 230 = 60$ and $290 - 260 = 30$ and $290 - 240 = 50$

If C made the mistake, then a maximum score of 85 is obtained. So, $85 \times 10{,}000 =$ Rs.8.5 lakh.

Choice (4)

25. Let us refer to each person by the first letter of his name.
First, let us find the possible scores of the contestants.
As the values given by five persons are correct, the sum of the values of these five people will be the sum of the five contestants score multiplied by 4. [because each got a different sum]
Let us add all the values given by the six persons.

$\Rightarrow$ 220 + 260 + 230 + 240 + 210 + 250 = 1410.

Assume A made the mistake. So, 1410 – 220 = 1190

Then, the sum of the five contestants = $\frac{1190}{4}$ = 297.5 which is not possible.

Assume B made the mistake. So, 1410 – 260 = 1150

Then the sum of the five contestants = $\frac{1150}{4}$ = 287.5 which is not possible.

Assume C made the mistake. So, 1410 – 230 = 1180

Then the sum of the five contestants = $\frac{1180}{4}$ = 295

Now, the possible scores are
295 – 210 = 85, 295 – 220 = 75, 295 – 240 = 55, 295 – 250 = 45 and 295 – 260 = 35.

Assume D made the mistake. So, 1410 – 240 = 1170.

Then the sum of the five contestants = $\frac{1170}{4}$ = 292.5 which is not possible.

Assume E made the mistake. So, 1410 – 210 = 1200

Then, the sum of the five contestant = $\frac{1200}{4}$ = 300.

Now, the possible scores are 300 – 220 = 80,
300 – 230 = 70, 300 – 240 = 60, 300 – 250 = 50 and 300 – 260 = 40

Assume F made a mistake. So, 1410 – 250 = 1160

Then the sum of the five contestants = $\frac{1160}{4}$ = 290

Now, the possible scores are
290 – 210 = 80, 290 – 220 = 70, 290 – 230 = 60 and 290 – 260 = 30 and 290 – 240 = 50

In all the three cases possible none of the scores is constant.   Choice (1)

26. Let us refer to each person by the first letter of his name.

First, let us find the possible scores of the contestants.

As the values given by five persons are correct, the sum of the values of these five people will be the sum of the five contestants score multiplied by 4. [because each got a different sum]

Let us add all the values given by the six persons.

$\Rightarrow$ 220 + 260 + 230 + 240 + 210 + 250 = 1410.

Assume A made the mistake. So, 1410 – 220 = 1190

Then, the sum of the five contestants = $\dfrac{1190}{4}$ = 297.5 which is not possible.

Assume B made the mistake. So, 1410 – 260 = 1150

Then the sum of the five contestants = $\dfrac{1150}{4}$ = 287.5 which is not possible.

Assume C made the mistake. So, 1410 – 230 = 1180

Then the sum of the five contestants = $\dfrac{1180}{4}$ = 295

Now, the possible scores are

295 – 210 = 85, 295 – 220 = 75, 295 – 240 = 55, 295 – 250 = 45 and 295 – 260 = 35.

Assume D made the mistake. So, 1410 – 240 = 1170.

Then the sum of the five contestants = $\dfrac{1170}{4}$ = 292.5 which is not possible.

Assume E made the mistake. So, 1410 – 210 = 1200

Then, the sum of the five contestant = $\dfrac{1200}{4}$ = 300.

Now, the possible scores are 300 – 220 = 80,

300 – 230 = 70, 300 – 240 = 60, 300 – 250 = 50 and 300 – 260 = 40

Assume F made a mistake. So, 1410 – 250 = 1160

Then the sum of the five contestants = $\dfrac{1160}{4}$ = 290

Now, the possible scores are

290 – 210 = 80, 290 – 220 = 70, 290 – 230 = 60 and 290 – 260 = 30 and 290 – 240 = 50

If E made the mistake a total sum of Rs.30 lakh is possible with one contestant receiving Rs.5 lakhs. Also, if F made the mistake, then a total sum of Rs.29 lakh is possible with one contestant receiving Rs.5 lakhs.   Choice (5)

27. Let us refer to each person by the first letter of his name.

First, let us find the possible scores of the contestants.

As the values given by five persons are correct, the sum of the values of these five people will be the sum of the five contestants score multiplied by 4. [because each got a different sum]

Let us add all the values given by the six persons.

$\Rightarrow$ 220 + 260 + 230 + 240 + 210 + 250 = 1410.

Assume A made the mistake. So, 1410 – 220 = 1190

Then, the sum of the five contestants = $\dfrac{1190}{4}$ = 297.5 which is not possible.

Assume B made the mistake. So, 1410 – 260 = 1150

Then the sum of the five contestants = $\dfrac{1150}{4}$ = 287.5 which is not possible.

Assume C made the mistake. So, 1410 – 230 = 1180

Then the sum of the five contestants = $\dfrac{1180}{4}$ = 295

Now, the possible scores are

295 – 210 = 85, 295 – 220 = 75, 295 – 240 = 55, 295 – 250 = 45 and 295 – 260 = 35.

Assume D made the mistake. So, 1410 – 240 = 1170.

Then the sum of the five contestants = $\dfrac{1170}{4}$ = 292.5 which is not possible.

Assume E made the mistake. So, 1410 – 210 = 1200

Then, the sum of the five contestant = $\dfrac{1200}{4}$ = 300.

Now, the possible scores are 300 – 220 = 80,

300 – 230 = 70, 300 – 240 = 60, 300 – 250 = 50 and 300 – 260 = 40

Assume F made a mistake. So, 1410 – 250 = 1160

Then the sum of the five contestants = $\dfrac{1160}{4}$ = 290

Now, the possible scores are

290 – 210 = 80, 290 – 220 = 70, 290 – 230 = 60 and 290 – 260 = 30 and 290 – 240 = 50

If E made a mistake, 80 + 70 = 150, and hence a sum of Rs.15 lakh is possible.

If F made a mistake, 80 + 70 = 150 and hence a sum of 15 lakh is possible.

But if C made a mistake, the sum of no two candidates' scores equals 150.

Hence from the choices given, E could have made the mistake.   Choice (4)

28. After filling the blocks with appropriate values, all the questions can be answered quickly
For example:
For College A,
20% of students = 200
80% of students = 800
No of boys passed = number of girls passed = 60 : 100 = 3 : 5
Number of boys passed = 3/8 x 800 = 300
Number of boys = 50% of 800 = 400
In this way

Name of college	Number of boys passed	Number of boys	Number of students passed	Number of students failed	Number of Sportspersons as a percentage of sportsmen
A	300	500	800	200	112 ½ %
B	180	420	420	280	125%
C	280	440	560	240	133^1/$_3$%
D	175	350	300	300	100%

Average number of students who passed = $\dfrac{800+420+560+300}{4}$ = 520

Only colleges A and C satisfy, i.e., only 2 colleges.   Choice (3)

29. After filling the blocks with appropriate values, all the questions can be answered quickly
For example:
For College A,
20% of students = 200
80% of students = 800
No of boys passed = number of girls passed = 60 : 100 = 3 : 5
Number of boys passed = 3/8 x 800 = 300
Number of boys = 50% of 800 = 400
In this way

Name of college	Number of boys passed	Number of boys	Number of students passed	Number of students failed	Number of Sportspersons as a percentage of sportsmen
A	300	500	800	200	112 ½ %
B	180	420	420	280	125%
C	280	440	560	240	133^1/$_3$%
D	175	350	300	300	100%

The number of sportspersons as a percentage of total number of students is not given.
                                                    Choice (5)

30. After filling the blocks with appropriate values, all the questions can be answered quickly

For example:

For College A,

20% of students = 200

80% of students = 800

No of boys passed = number of girls passed = 60 : 100 = 3 : 5

Number of boys passed = 3/8 x 800 = 300

Number of boys = 50% of 800 = 400

In this way

Name of college	Number of boys passed	Number of boys	Number of students passed	Number of students failed	Number of Sportspersons as a percentage of sportsmen
A	300	500	800	200	112 ½ %
B	180	420	420	280	125%
C	280	440	560	240	133 $^1/_3$%
D	175	350	300	300	100%

Number of sportswomen to the number of sportsmen = $\dfrac{331}{3}$ % : 100% = 1 : 3

No of sportswomen = 30

No of sportsmen = 90

Number of sports person = 120

Number of students who are not sportspersons = 680/800 x 100 = 85%   Choice (3)

31. It is given that
For each Pharmaceutical company, sales is more than Rs.5000 crore.

∴ The possible pharmaceutical companies are A, B, C, E, I, J

Similarly by taking the condition given for other sectors.

The possible Mobile companies are B, C, E, F, K

The possible Automobile companies are D, E, F, G, H

The possible constructions companies are C, D, H, I, J, L
From the above details,

A cannot belong to any other sector ⇒ A is a pharmaceutical company
Similarly,
K → Mobile company
G → Automobile company
L → Construction company

Now by taking the condition given for the pharmaceutical sector, and comparing with A except C all others satisfied.

Pharma : A, B, E, I, J

Similarly, by observing the condition for mobiles, and comparing with K, except C all other companies satisfied

Mobiles : B, E, F, K

By observing the condition for Automobiles, and comparing with G, except for E all others satisfied.

Automobiles : D, F, G, H

By observing the condition for construction, and comparing with company L, except D and J all others satisfied.

Construction : C, H, I, L

Now from the above results, C must be a construction Company, D must be an automobile company, J must be a pharmaceutical company.
Now by comparing D and H, H cannot be an automobile company, which means H must be a construction company. Similarly, by comparing J and E, E cannot be a pharma company.
Hence, E must be a mobile company. Also, comparing H and I, I cannot be a construction company. Therefore I is a pharma company. Hence the final distribution is:

Mobiles   : K, E

Construction   : C, L, H

Automobile : G, D

Pharma   : A, I, J

and B is either Mobiles or Pharma. F is either Mobiles or Automobile.

C must be a construction company.   Choice (4)

32. It is given that

For each Pharmaceutical company, sales is more than Rs.5000 crore.

∴ The possible pharmaceutical companies are | A, B, C, E, I, J |

Similarly by taking the condition given for other sectors.

The possible Mobile companies are | B, C, E, F, K |

The possible Automobile companies are | D, E, F, G, H |

The possible constructions companies are | C, D, H, I, J, L |
From the above details,

A cannot belong to any other sector ⇒ A is a pharmaceutical company
Similarly,
K → Mobile company
G → Automobile company
L → Construction company

Now by taking the condition given for the pharmaceutical sector, and comparing with A except C all others satisfied.

Pharma : | A, B, E, I, J |

Similarly, by observing the condition for mobiles, and comparing with K, except C all other companies satisfied

Mobiles : | B, E, F, K |

By observing the condition for Automobiles, and comparing with G, except for E all others satisfied.

Automobiles : | D, F, G, H |

By observing the condition for construction, and comparing with company L, except D and J all others satisfied.

Construction : | C, H, I, L |

Now from the above results, C must be a construction Company, D must be an automobile company, J must be a pharmaceutical company.
Now by comparing D and H, H cannot be an automobile company, which means H must be a construction company. Similarly, by comparing J and E, E cannot be a pharma company.
Hence, E must be a mobile company. Also, comparing H and I, I cannot be a construction company. Therefore I is a pharma company. Hence the final distribution is:

Mobiles : | K, E |

Construction : | C, L, H |

Automobile : | G, D |

Pharma : | A, I, J |

and B is either Mobiles or Pharma. F is either Mobiles or Automobile.

E cannot be a pharmaceutical company.   Choice (2)

33. It is given that
For each Pharmaceutical company, sales is more than Rs.5000 crore.

∴ The possible pharmaceutical companies are | A, B, C, E, I, J |

Similarly by taking the condition given for other sectors.

The possible Mobile companies are | B, C, E, F, K |

The possible Automobile companies are | D, E, F, G, H |

The possible constructions companies are | C, D, H, I, J, L |
From the above details,

A cannot belong to any other sector ⇒ A is a pharmaceutical company
Similarly,
K → Mobile company
G → Automobile company
L → Construction company

Now by taking the condition given for the pharmaceutical sector, and comparing with A except C all others satisfied.

Pharma : | A, B, E, I, J |

Similarly, by observing the condition for mobiles, and comparing with K, except C all other companies satisfied

Mobiles : | B, E, F, K |

By observing the condition for Automobiles, and comparing with G, except for E all others satisfied.

Automobiles : | D, F, G, H |

By observing the condition for construction, and comparing with company L, except D and J all others satisfied.

Construction : | C, H, I, L |

Now from the above results, C must be a construction Company, D must be an automobile company, J must be a pharmaceutical company.
Now by comparing D and H, H cannot be an automobile company, which means H must be a construction company. Similarly, by comparing J and E, E cannot be a pharma company.
Hence, E must be a mobile company. Also, comparing H and I, I cannot be a construction company. Therefore I is a pharma company. Hence the final distribution is:

Mobiles   : | K, E |

Construction   : | C, L, H |

Automobile : | G, D |

Pharma   : | A, I, J |

and B is either Mobiles or Pharma. F is either Mobiles or Automobile.

Only Mobiles or Pharma could possibly have four companies.   Choice (3)

34. It is given that
For each Pharmaceutical company, sales is more than Rs.5000 crore.

∴ The possible pharmaceutical companies are A, B, C, E, I, J

Similarly by taking the condition given for other sectors.

The possible Mobile companies are B, C, E, F, K

The possible Automobile companies are D, E, F, G, H

The possible constructions companies are C, D, H, I, J, L
From the above details,

A cannot belong to any other sector ⇒ A is a pharmaceutical company
Similarly,
K → Mobile company
G → Automobile company
L → Construction company

Now by taking the condition given for the pharmaceutical sector, and comparing with A except C all others satisfied.

Pharma : A, B, E, I, J

Similarly, by observing the condition for mobiles, and comparing with K, except C all other companies satisfied

Mobiles : B, E, F, K

By observing the condition for Automobiles, and comparing with G, except for E all others satisfied.

Automobiles : D, F, G, H

By observing the condition for construction, and comparing with company L, except D and J all others satisfied.
Construction : C, H, I, L

Now from the above results, C must be a construction Company, D must be an automobile company, J must be a pharmaceutical company.
Now by comparing D and H, H cannot be an automobile company, which means H must be a construction company. Similarly, by comparing J and E, E cannot be a pharma company.
Hence, E must be a mobile company. Also, comparing H and I, I cannot be a construction company. Therefore I is a pharma company. Hence the final distribution is:

Mobiles   : K, E

Construction : C, L, H

Automobile : G, D

Pharma   : A, I, J

and B is either Mobiles or Pharma. F is either Mobiles or Automobile.

The companies and the sectors are
A, J, I – Pharma
K, B, E – Mobiles
L, C, H – Construction
G, D, F – Automobiles
None of the statements is true.   Choice (5)

35. Let the order of the persons based on their heights is as follows.

$$\overline{1} \quad \overline{2} \quad \overline{3} \qquad \overline{4} \quad \overline{5} \quad \overline{6} \quad \overline{7} \quad \overline{8}$$

Here, 1 represents the shortest and 8 represents the tallest.
From (i), we get

$$\underset{1}{-} \quad \underset{2}{-} \quad \underset{3}{-} \qquad \underset{4}{-} \quad \underset{5}{\overset{B}{-}} \quad \underset{6}{-} \quad \underset{7}{\overset{A}{-}} \quad \underset{8}{-}$$

From (iii), H is taller than G but shorter than B. Also from (iv), C is shorter than G but taller than F. Hence, we get

$$\underset{1}{\overset{F}{-}} \quad \underset{2}{\overset{C}{-}} \quad \underset{3}{\overset{G}{-}} \qquad \underset{4}{\overset{H}{-}} \quad \underset{5}{\overset{B}{-}} \quad \underset{6}{-} \quad \underset{7}{\overset{A}{-}} \quad \underset{8}{-}$$

Also, D is shorter than A. Hence, E must be the tallest.
The final order must be as follows.

$$\Rightarrow \quad \underset{1}{\overset{F}{-}} \quad \underset{2}{\overset{C}{-}} \quad \underset{3}{\overset{G}{-}} \qquad \underset{4}{\overset{H}{-}} \quad \underset{5}{\overset{B}{-}} \quad \underset{6}{\overset{D}{-}} \quad \underset{7}{\overset{A}{-}} \quad \underset{8}{\overset{E}{-}}$$

Given, B and E are from 2nd standard Also C is not from 3rd standard and neither the shortest nor the 2nd shortest (i.e., F and C) is from 1st standard.
$\Rightarrow$ C is also from 2nd standard. As three are from 1st standard and two are from 3rd standard F and A are from 3rd standard (as they are not from 1st standard) and D, G and H are from 1st standard.

Only G and H are adjacent as well as from the same standard i.e. 1st standard.

Choice (3)

36. Let the order of the persons based on their heights is as follows.

$$\overline{1} \quad \overline{2} \quad \overline{3} \qquad \overline{4} \quad \overline{5} \quad \overline{6} \quad \overline{7} \quad \overline{8}$$

Here, 1 represents the shortest and 8 represents the tallest.
From (i), we get

$$\overline{1} \quad \overline{2} \quad \overline{3} \qquad \overline{4} \quad \overset{B}{\overline{5}} \quad \overline{6} \quad \overset{A}{\overline{7}} \quad \overline{8}$$

From (iii), H is taller than G but shorter than B. Also from (iv), C is shorter than G but taller than F. Hence, we get

$$\overset{F}{\underset{1}{\rule{0pt}{0pt}}} \quad \overset{C}{\underset{2}{\rule{0pt}{0pt}}} \quad \overset{G}{\underset{3}{\rule{0pt}{0pt}}} \qquad \overset{H}{\underset{4}{\rule{0pt}{0pt}}} \quad \overset{B}{\underset{5}{\rule{0pt}{0pt}}} \quad \overline{6} \quad \overset{A}{\underset{7}{\rule{0pt}{0pt}}} \quad \overline{8}$$

Also, D is shorter than A. Hence, E must be the tallest.
The final order must be as follows.

$$\Rightarrow \quad \overset{F}{\underset{1}{\rule{0pt}{0pt}}} \quad \overset{C}{\underset{2}{\rule{0pt}{0pt}}} \quad \overset{G}{\underset{3}{\rule{0pt}{0pt}}} \qquad \overset{H}{\underset{4}{\rule{0pt}{0pt}}} \quad \overset{B}{\underset{5}{\rule{0pt}{0pt}}} \quad \overset{D}{\underset{6}{\rule{0pt}{0pt}}} \quad \overset{A}{\underset{7}{\rule{0pt}{0pt}}} \quad \overset{E}{\underset{8}{\rule{0pt}{0pt}}}$$

Given, B and E are from 2nd standard Also C is not from 3rd standard and neither the shortest nor the 2nd shortest (i.e., F and C) is from 1st standard.
$\Rightarrow$ C is also from 2nd standard. As three are from 1st standard and two are from 3rd standard F and A are from 3rd standard (as they are not from 1st standard) and D, G and H are from 1st standard.

B, a 2nd standard student is not adjacent to a 3rd standard student.
∴ (1) is false.
Both A and F (i.e., 3rd standard students) are adjacent to 2nd standard students.
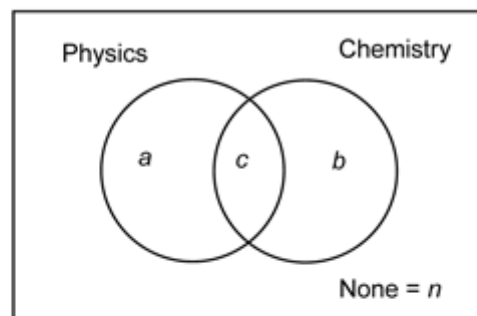∴ (2) is true
G and H are from the same standard and are adjacent to each other.
∴ (3) is false.

Choice (2)

37. Consider the following Venn-diagram

Let a, b and c represent those who passed only in Physics, only in Chemistry and in both the subjects respectively. Required to find $|a - b|$
Given, $c = n$.
From I, $a + c = 100$ and $a = 40$.
$\Rightarrow c = 60$
But we cannot find $|a - b|$, since we don't know the value of b.
∴ We cannot answer the question.
From II, $a + n = b + n$
$\Rightarrow a = b$
∴ II alone in sufficient.

Choice (2)

38. Let the number of students = n

From statement A :
Highest marks = 95
Lowest marks = 55.

Here, we don't know the marks of remaining $(n-2)$ candidates. So, the number of students in the class can't be determined from A alone.

From statement B :
Let total marks of the students who scored the highest and lowest marks = x.
Average marks of $(n-2)$ candidates = 75.

Here $\dfrac{75(n-2)+x}{n} = 75 \Rightarrow x = 150$

But we can't find n.
So, statement (B) alone is not sufficient.

Using statement (A) and statement (B) gives,
$\dfrac{(95+55)+(75)(n-2)}{n} = 75$.

The above case is an identity. So, many values of n are possible.　　　Choice (5)

39. Let the number of white sheep = w_1
$\Rightarrow$ Number of brown sheep = $100 - w$,

(i)　White sheep $\Rightarrow$
```
White offspring
      or
Black offspring
```

(ii)　Brown sheep $\Rightarrow$
```
White offspring
      or
Brown offspring
```

Let the number of white offspring from white sheep = w_2
$\Rightarrow$ The number of black offspring from white sheep = $w_1 - w_2$
Also, the number of brown offspring from brown sheep = b_1
$\Rightarrow$ the number of white offspring from brown sheep = $100 - w_1 - b_1$
From statement A, $w_2 + 100 - w_1 - b_1 = 50$
$\Rightarrow w_1 + b_1 = w_2 + 50$
(I) alone is not sufficient.
From statement II, $b_1 = 10 + w_1 - w_2$
(II) alone is not sufficient.
Statement (I) + Statement (II)
$\Rightarrow w_1 (10 + w_1 - w_2) = w_2 + 50$
$2w_1 = 40 + 2w_2 \Rightarrow w_1 - w_2 = 20$
Hence, w_1 can't be determined uniquely.　　　Choice (5)

40. Form statement I,
Ram: A, B scored centuries.
Mohan: The group out of A, C, D having scored centuries can be (AC), (AD), (CD) or (A, C, D)
Thus statement (I) alone is not sufficient.
Also, statement (II) alone is not sufficient.
From statement (I) and statement (II) combined,

Ram is truth teller. This implies A and B must have scored centuries Mohan lies. This implies none or only one person out of A, C, D must have scored centuries. Already A has scored century. So, C and D must not have scored century.
Both statements together are sufficient.　　　Choice (3)

Verbal Ability

41. Happen is used to refer to events that are not planned or expected. Occur is used in formal situations. In this context occurred is apt – A. only the word electrical collocates with equipment. Electric is usually used to describe something that uses or produces electricity – B. Trade which refers to a job especially one that involves working with your hands and that requires special training and skills. Hence A is apt.

    While light has several different meanings and is used in many phrases, lighting can be used to talk about the type of light in a place or how lights are used to achieve a particular effect. Only lighting suits the context – B. Faint refers to something which cannot be clearly seen. 'Feint' refers to a movement that is intended to make your opponent think that you are going to do one thing when you are really going to do something else. Only feint suits the context – A. Hence the correct sequence is ABABA.   Choice (4)

42. Swift is used to describe something that happens or is done quickly and immediately. The speed and promptness of an action is best conveyed through the word swift. Rapid is most commonly used to describe the speed at which something changes. Only the latter is apt in the context – B. Farther is used to talk about distance while further means more or additional, only A is apt. Gadget refers to a small tool or device that does something useful. Appliance refers to a machine that is designed to do a particular job. Machines used for particular purposes in the kitchen are referred to as kitchen gadgets – A. The word averse which means not liking something or wanting to do something is more apt in the context when compared to the word adverse (harmful undesirable) – A. Avenge which means to punish or hurt somebody in return for something bad or wrong that they have done to you is apt in the context. Average is to take revenge. Hence BAAAA is the correct order.   Choice (3)

43. Venal which means corrupt is suitable in the given context as compared to venial (pardonable) – A. Imminent refers to something unpleasant which is likely to happen very soon. Eminent means famous. The former is apt in the context – A. The word apostle which refers to a person who strongly believes in a policy or an idea and tries to make other people believe in it is suitable in the given context when compared to the word apostate (a person who has rejected their religious or political beliefs) – B. Gregarious is more suitable than egregious (extremely bad) – A. The word abrogate (to end a law, agreement or custom formally) is apt in the context than abnegate (give up or reject) – B. Hence AABAB is the correct sequence.   Choice (3)

44. **Number of words and Explanatory notes for RC:**

    Number of words : 956

    The question raised at the beginning of the passage is 'Where does morality came from?' Some theories and views regarding this has been analysed but no answer is arrived at as is clear from the last sentence of the passage.   Choice (4)

45. **Number of words and Explanatory notes for RC:**

    Number of words : 956

    Choice 1 is not the author's view but of 'many psychologists' and 'Jonathan Hordt' (refer to para 2). The others are the author's view as seen from para 3.   Choice (1)

46. **Number of words and Explanatory notes for RC:**

    Number of words : 956

    Refer to para 5 – C and E are true.   Choice (3)

47. The expression 'wafting through air' is incorrect in choice 3. The correction is 'wafting through the air'. We say 'the air' to refer to the space above the ground or around things. Choice (3)

48. Choice 3 is erroneous. The correct expression is 'turn your back on'. To turn your back on somebody or something is to reject somebody or something that you have been previously connected with. Choice (3)

49. The usage of get is incorrect in choice 5. 'Get over' should be followed by 'with'. To 'get over with' something is to complete something. Choice (5)

50. **Number of words and Explanatory notes for RC:**

Number of words : 734

Statements (A) and (C) can be supported by the content in the last sentence of para (2) and paras (3) and (4). Statement (B) is not suggested anywhere. Statement (D) is partially correct the second half of the statement (if and when to compromise) can't be supported. So choice (1) is the correct answer. Choice (1)

51. **Number of words and Explanatory notes for RC:**

Number of words : 734

Choice (5) is the best answer. Refer to the sixth para. Only the fifth option can be supported by the content in the para. Choice (1) misrepresents the idea. When governmental or constitutional needs are fulfilled, an action can be considered to have political merit. Choice (2) is not suggested. Choice (3) is also not suggested. Choice (4) can be easily ruled out. Choice (5)

52. **Number of words and Explanatory notes for RC:**

Number of words : 734

Choice (3) is the answer. Refer to para (4), which suggests that newspapers were disappointed that political parties were not cooperating with each other. They were unrelenting in their attitude. The expression 'stick to one's guns' means to refuse to compromise or change one's stand despite criticism. Newspapers bemoaned the fact that political parties were not adopting a give and take approach (cooperate or compromise). (In other words, they were sticking to their guns). The word 'conciliatory' in option (4) is not apt in this context. Conciliatory means placatory, pacifying appeasing or mollifying. Conciliatory suggests having the effect or intention of making angry people calm, more in the nature of pacifying someone. A conciliatory approach could also involve doing something in order to make someone stop arguing with you. In all these cases, it means one party or one side going the extra mile to settle differences. Cooperation is the coming together of both sides. A cooperative approach is what the passage talks of and not a conciliatory approach. Note that the word 'conciliate' also means 'to make or attempt to make compatible, to reconcile'. Again, the onus of doing this rests on one party or one side. Hence, choice (3) works best. Choice (3)

53. The given para speaks about the importance of water in the lives of human beings. Excessive exploitation of ground water and pollution of fresh water resources have resulted in the scarcity of water. Statement 1 can be a continuation of the original sentence but not a conclusion. Statement 3 speaks about the regulation of the exploitation of water resources in our country while the passage speaks about the exploitation of water resources in the earth in general. Statements 4 and 5 digress. Statement 2 is the best concluding statement. Choice (2)

54. The given para talks about the repercussions of justice being denied by any society. Denial of justice leads to terrorism and other extreme forms of violence. Choice 3 states that in order to prevent this, justice must be made accessible even at the grass roots level. Choices 1 and 2 are mere repetitions of what is stated in the para. Choices 4 and 5 are not in keeping with what is stated in the para.   Choice (3)

55. The passage speaks about why we must not justify our mistakes. Choice 2 concludes the para by saying that justifying our actions precludes learning from the mistake. Choice 1 does not gel with the passage. Statement 3 can be eliminated because the focus of the para is not on avoiding justifications. Choices 4 and 5 digress.
                                                                              Choice (2)

56. **Number of words and Explanatory notes for RC:**

    Number of words : 619

    Choice (5) is the answer. Refer to the first sentence of the penultimate para, which negates option (1) and (2) and (3) (not just by rational judgements or personal history) but also by our distant past. Note that all the options are distorted.   Choice (5)

57. **Number of words and Explanatory notes for RC:**

    Number of words : 619

    Refer to the first two paras. Fear is not a characteristic of only human. So, Choice (1) is incorrect. This is not case of defence mechanism. A mental process, initiated unconsciously to avoid experiencing conflict or anxiety is a defence mechanism. So, choice (2) is also wrong. While choice (3) can be inferred, it does not provide the answer to this question. Choice (5) is vague and incomplete. Choice (4) is the answer. Refer to the first line of para 3 …… the fear that mobilizes us to protect our family from danger ……   Choice (4)

58. **Number of words and Explanatory notes for RC:**

    Number of words : 619

    Choice (3) is a distortion and hence is the answer. Refer to para (3). An emotional high and emotional excess are not the same. On a high would relate to only ecstatic mood. An emotional high could be one of the several emotional excesses. Para (5) supports option (1), and para (4) backs options (2) and (5).
    The example cited in the passage supports option (4).   Choice (3)

59. Statement A states that no serious side effects were seen in people who have been vaccinated by the influenza vaccine. D follows A by referring to earlier apprehensions about the vaccine's safety. B is an extension of D accounting for what is stated in D. E is linked to B through the word fast-tracking. Studies of this size in E refers to the studies conducted on the small group of volunteers mentioned in B. C concludes the para by saying that the initial apprehensions are now put to rest. Hence DBEC is the correct sequence.   Choice (3)

60. Statement A begins the paragraph by talking about South Asia. Statement E follows by specifically talking about India which is the largest country in South Asia and how all countries in South Asia look to India either as a friend or as a foe. It is clear that BD together – 'the tag' in D refers to 'friend' or 'threat' in B. C follows E by mentioning what makes India one of the most important countries in South Asia. B is a continuation of C. 'The same path of democracy, secularism ….' in C is linked to the democratic and secular credentials of India mentioned in C. D which says it is the responsibility of India to send a message that it is ready to become the engine of change, is the concluding statement. Hence ECBD is the correct sequence.   Choice (4)