COGNITIVE SCIENCE JOINT ENTRANCE TEST - 2019
COGJET-2019

Instructions:

1. The paper has 2 parts - Part I and Part II.

2. Part I contains 40 general aptitude multiple choice questions. These are equally distributed between quantitative, reasoning, data interpretation and text comprehension questions.

3. Part II contains 32 multiple choice questions equally divided between elementary mathematics and computing and basic psychology and hypothesis testing.

4. Scores will be reported separately for both parts so ensure that you divide your time suitably between both parts.

5. The total time available is 180 minutes.

6. No paper of any kind or any electronic gadget is allowed in the examination hall. Carry only your admit card and original ID proof.

7. Answers should be marked on the separate answer sheet provided.

8. Each question has 4 choices labelled A, B, C, D as possible answers. There is only ONE correct or the closest approximate or appropriate answer.

9. To answer you must darken your chosen option (a circle) for each question with a black/blue pen - do not use a pencil.

10. Ensure that you write your application number and name in the answer sheet.

11. Each correct answer gets 3 marks and each wrong answer gets (-1) mark. Questions that are not attempted do not get any marks.

12. Do not ask for any clarifications on the question paper or questions from the invigilators. They have been advised not to respond to any such clarificatory queries.
Part I: Aptitude

Question 1. What is the largest integer $k$ such that $3^k < 27^{15}$?
A. 44  B. 46  C. 18  D. 17

Question 2. Priya and Shweta are playing a dice game in which a six sided die (with faces numbered 1 to 6) is rolled 5 times. If any number turns up exactly 3 times then the game is won. Shweta has thrown the die twice and got number 4 both times.
Assuming the die is fair what is the probability that Shweta will win the game?
A. $\frac{75}{216}$  B. $\frac{80}{216}$  C. $\frac{90}{216}$  D. $\frac{1}{2}$

Question 3. Traveling at the same speed, a train takes 5 seconds to cross a telephone pole and 10 seconds to cross a railway platform that is 100 meters long. How long is the train?
A. 200 meters  B. 150 meters  C. 100 meters  D. 50 meters

Question 4. Let $m$ and $n$ be the roots of the equation $x^2 - 6x + 8$ where $m > n$ then $(m+n)(m-n)$ is:
A. 4  B. 8  C. 12  D. 16

Question 5. $n$ is a 4 digit number whose first two digits and last two digits are the same. $n$ is also a perfect square. How many such numbers are possible?
A. 1  B. 2  C. 3  D. 0

Question 6. A 40 liters mixture of milk and water had 80% concentration of milk. A part of the mixture was replaced with an equal quantity of water to achieve 50% concentration of milk. What volume of the mixture (in liters) was replaced to achieve the desired concentration?
A. 20  B. 18  C. 15  D. 12

Question 7. Two cities A and B are connected by three routes R, S, and P whose lengths are in the ratio 3 : 4 : 3. Three people travel from A to B in an SUV, a sedan, and a bike along the routes R, S, and P respectively. The amount of fuel spent by the SUV, sedan and bike is in the ratio 6 : 2 : 3. What is the ratio of their fuel efficiencies i.e. fuel consumed per unit distance travelled by the SUV, sedan and bike?

Question 8. A coin toss game works as follows: there is an entry fee of Rs.15/- to start the game and you pay Re. 1/- for every coin toss. The game stops whenever you get two consecutive Heads and you are paid Rs.100/-. You play the game and when it stops you find you have lost Rs.55/-. What are lower and upper limits for the number of times Tails can occur in the game?
A. (70, 140)  B. (70, 138)  C. (69, 138)  D. (69, 140)

Question 9. Let $A \subset \{3, 11, 19, 27, \ldots, 483, 491, 499\}$ such that the sum of any two elements of $A$ is never 502. What is the maximum possible size of the set $A$?
A. 32  B. 31  C. 30  D. 29
Question 10. Consider a set $P$ of pairs of distinct numbers $(i,j)$ where $i < j$ and $1 \leq i < j \leq n$, where $n > 3$. So, for $n = 4$ we have $P = \{(1,2), (1,3), (1,4), (2,3), (2,4), (3,4)\}$. For any two pairs $(i,j)$ and $(k,l)$ they belong to a family if one number is common, so $(1,2), (1,3)$ belong to a family as do $(1,3)$ and $(3,4)$. If the two pairs have no number in common they are called foreign, for example $(1,2)$ and $(3,4)$ or $(1,3)$ and $(2,4)$. For any member of $P$ what is the expression for the number of foreign pairs in terms of $n$.

A. $(n^2 - 5n + 6)$  B. $\frac{n^2 - 5n + 6}{2}$  C. $(n^2 - 2n + 3)$  D. $\frac{n^2 - 2n + 3}{2}$

Question 11. You have been asked to draft a case for banning the smoking of cannabis in India. Which of the following is NOT a logical argument you could use?

A. Smoking cannabis is immoral and the state is the upholder of public morality.

B. Managing the health effects of smoking is a burden on the state.

C. Smoking causes cancer and destroys families, which increases the welfare burden of the state.

D. Smoking harms the environment, which is part of the public commons that the state is bound to protect.

Question 12. An engineering college is accused of gender discrimination, because nine tenths of its students are male. The college’s logical defence against this charge is to argue that:

A. Male and female students entered the college using the same entrance exam and the same merit cut-off.

B. Engineering subjects are unattractive to women students.

C. Nine times more men than women took the college’s entrance exam.

D. The placement outcomes for men students are better than women.

Question 13. Find the missing number (indicated by ?) in the series below:

$$387, 338, 302, 277, ?, 252, 248, 247$$

A. 259  B. 261  C. 271  D. 73

Question 14. A, B, C, D, E are friends. In the group one plays the sitar, one the sarod and one the violin. A and D are unmarried women and do not play any instrument. None of the women plays either the sarod or the violin. E is the husband of C and B is C’s brother and does not play the sitar or the sarod. Who plays the violin?

A. A  B. B  C. C  D. E

Question 15. A class has 27 students studying one or more of the subjects mathematics, economics and psychology. 15 students are good at psychology and economics. 12 students are good at mathematics and economics. And 5 students are good at all three subjects. How many students are not good at any subject?

A. 5  B. 6  C. 7  D. None of the others
Instructions for questions 16 to 18. Read the information given below and then answer the questions that follow.

Consider a tennis tournament that has 32 players seeded from 1 to 32. In round one matches 1 to 16 are played as follows: seed 1 plays seed 32, seed 2 plays seed 31 and so on so that in match 16 seed 16 plays seed 17. Assume we represent each match as the pair (round, match no. in round)- that is (1,1) to (1,16). For the second round a similar pattern is applied to match numbers of the first round giving 8 matches in round two from (2,1) to (2,8). So, match (2,1) is between winners of match (1,1) and (1,16), similarly match (2,8) is between winners of (1,8) and (1,9). This is repeated in the third, fourth and fifth (i.e. final) rounds where we have a winner. We say there has been an upset if in a match a lower ranked player beats the higher ranked player.

**Question 16.** If there are no upsets in the first round and upsets in matches (2,6), (2,7) and (2,8) which seed will meet seed 2 in the third round assuming seed 2 has reached the third round.
A. Seed 7  B. Seed 9  C. 10  D. 11

**Question 17.** If seed 6 and seed 8 lose in the second round and seeds 7 and 9 make it to the 4th round (semi-finals) who will play seed 1 in round 3 (quarterfinals) assuming seed 1 has reached round 3.
A. Seed 7  B. Seed 9  C. Seed 11  D. Seed 22

**Question 18.** If the top 8 seeds reach round 3 then who amongst the following will definitely not play seed 1 assuming seed 1 reaches the final.
A. Seed 6  B. Seed 4  C. Seed 3  D. Seed 2

**Question 19.** Three children C1, C2, C3 who belong to three different schools S1, S2, S3 (not respectively) located in three different towns T1, T2, T3 (again not respectively) participated in a contest and won prizes. Below is some information about the children, schools and towns.

1. The contestant from S1 did not come first.
2. S2’s contestant was C2.
3. S3 is not at T3.
4. The child from T2 took third place.
5. The child from T2 is not from S1.
6. The child from T1 did not come first.
7. Child C3 is not from S3.

The first, second and third prizes were awarded to (in order):
A. C2,C3,C1  B. C2,C1,C3  C. C1,C3,C2  D. C1,C2,C3

**Question 20.** Given the following two premises 1 and 2 and two conclusions a) and b):

1. Many actors are singers.
2. All singers are dancers.

a) Some actors are dancers.
b) No singer is an actor.

Which of the following is true?
A. Only a  B. Only b  C. Both a and b  D. Neither a nor b.

**Instructions for questions 21 and 22:**
The figure below shows the profit versus turnover for several medium sized companies in the textile, steel and cement sectors. All amounts are in lakhs of rupees and a triangle, square or circle represents data for one company.

![Graph](image)

**Question 21.** In how many companies is profit more than 10% of turnover?
A. 5  B. 6  C. 7  D. 8

**Question 22.** If you want to invest in a company that is making at least 10% profit and has turnover of at least 2000 then how many companies are available for investment?
A. 4  B. 3  C. 2  D. 1

**Instructions for questions 23 to 25:**
The table below gives admission data for a particular institute. Answer the questions that follow based on the data in the table.

<table>
<thead>
<tr>
<th>Year</th>
<th>Gender</th>
<th>No. of applicants</th>
<th>No. writing test</th>
<th>No. for interview</th>
<th>No. admitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>Male</td>
<td>61205</td>
<td>59981</td>
<td>684</td>
<td>171</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>19236</td>
<td>15389</td>
<td>138</td>
<td>48</td>
</tr>
<tr>
<td>2013</td>
<td>Male</td>
<td>63298</td>
<td>60133</td>
<td>637</td>
<td>115</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>45292</td>
<td>40763</td>
<td>399</td>
<td>84</td>
</tr>
</tbody>
</table>

Choose option A if only statement 1 is true.
Choose option B if only statement 2 is true.
Choose option C if both statements 1 and 2 are true.
Choose option D if both statements 1 and 2 are false.
Question 23.

1. The rate of success of going from written to interview for males was worse than for females in 2013.

2. The rate of success of going from written to interview for females was better in 2012 than 2013.

A.  B.  C.  D.

Question 24.

1. The percentage admitted with respect to the number of applicants was better for females than males in 2012.

2. The success rate of those who were interviewed was higher for males than females in 2012.

A.  B.  C.  D.

Question 25.

1. The fraction of absentees in the written test for females went down from 2012 to 2013.

2. The fraction of absentees in the written test for males was more than for females in 2013.

A.  B.  C.  D.

Question 26. You suddenly get a large amount of money which is in your custody for 10 days after which you have to return it. You decide to invest it for 10 days so that you can make some money. You have the following options to invest. You can use any mixture of options.

1. Put it in a fixed deposit for 10 days. Return is +0.1%.

2. Invest in stock bundle 1 that will give a return of +5% if stock index goes up and a return of -3% if stock index goes down.

3. Invest in stock bundle 2 that will give a return of -2.5% if stock index goes up and +2% if stock index goes down.

What is the maximum guaranteed return you can get?
A. 0.1%  B. 0.15%  C. 0.20%  D. 0.25%

Instructions for questions 27 and 28.

Study the data and description given below and answer the two questions that follow.

You are a researcher in a company that creates energy drinks of different kinds. You have five basic ingredients, say A, B, C, D, E. The attributes of these ingredients are given in the table below:
<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Protein%</th>
<th>Carbohydrate%</th>
<th>Fat%</th>
<th>Mineral%</th>
<th>Cost/unit vol.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>50</td>
<td>45</td>
<td>00</td>
<td>05</td>
<td>100</td>
</tr>
<tr>
<td>B</td>
<td>50</td>
<td>05</td>
<td>40</td>
<td>05</td>
<td>500</td>
</tr>
<tr>
<td>C</td>
<td>30</td>
<td>10</td>
<td>50</td>
<td>10</td>
<td>200</td>
</tr>
<tr>
<td>D</td>
<td>20</td>
<td>80</td>
<td>00</td>
<td>00</td>
<td>50</td>
</tr>
<tr>
<td>E</td>
<td>30</td>
<td>50</td>
<td>10</td>
<td>10</td>
<td>100</td>
</tr>
</tbody>
</table>

**Question 27.** In how many ways can you prepare a drink that contains 10% minerals and at least 30% protein and at least 30% carbohydrate?

A. 0  B. 1  C. 2  D. 3

**Question 28.** If you wish to make a drink with two ingredients that has 10% fat and at least 30% protein and lowest cost then which of the following will work?

A. (A,C)  B. (A,B)  C. (B,D)  D. (C,D)

**Instructions for questions 29 and 30.**

Read the data and description given below and answer the questions that follow.

A company has the production table shown below for the years 2011 to 2015 where all costs are in Rupees and the production volume is in units. The production capacity of the company is 2000 units. The selling price in 2015 was Rs.125/unit. Some costs vary with the quantum of production while others are more or less fixed and do not change in any systematic way with production.

<table>
<thead>
<tr>
<th>Item</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>Units produced</td>
<td>1000</td>
<td>900</td>
<td>1100</td>
<td>1200</td>
<td>1200</td>
</tr>
<tr>
<td>Material</td>
<td>50000</td>
<td>45100</td>
<td>55200</td>
<td>59900</td>
<td>60000</td>
</tr>
<tr>
<td>Labour</td>
<td>20000</td>
<td>18000</td>
<td>22100</td>
<td>24150</td>
<td>24000</td>
</tr>
<tr>
<td>Consumables</td>
<td>2000</td>
<td>2200</td>
<td>1800</td>
<td>1600</td>
<td>1400</td>
</tr>
<tr>
<td>Rent</td>
<td>1000</td>
<td>1000</td>
<td>1100</td>
<td>1100</td>
<td>1200</td>
</tr>
<tr>
<td>Taxes</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Maintenance</td>
<td>800</td>
<td>820</td>
<td>780</td>
<td>790</td>
<td>800</td>
</tr>
<tr>
<td>Operating cost</td>
<td>30000</td>
<td>27000</td>
<td>33500</td>
<td>36020</td>
<td>36000</td>
</tr>
<tr>
<td>Marketing</td>
<td>5750</td>
<td>5800</td>
<td>5800</td>
<td>5750</td>
<td>5800</td>
</tr>
</tbody>
</table>

Using 2015 as a reference year answer the questions below for 2016.

**Question 29.** If 1400 units are produced in 2016 what is the approximate cost per unit?

A. 104  B. 107  C. 110  D. 115

**Question 30.** The company can sell at most 1700 units and will have to reduce the price by Rs.5/- per unit if they want to sell more than 1400 units. What will be the maximum profit the company can make if it sells more than 1400 units?

A. 24400  B. 25400  C. 26200  D. 27800

**Question 31.** The word BOLT (underlined) is present in the four sentences below. In which sentence is it being used INCORRECTLY.

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Page 7
A. The shopkeeper showed us a bolt of fine red silk.
B. The nut was too small for the bolt.
C. The horse that was tied to the fence made a bolt for the gate.
D. He sat bolt upright.

Question 32. Choose the most appropriate option to fill in the blank (shown by ......) in the sentence below:

Archaeologists believe that the pieces of red-ware pottery excavated recently near Bhavnagar and ............ shed light on a hitherto dark 600 year period in the Harappan history of Gujarat.

A. estimated with a reasonable certainty as being about 3400 years old,
B. are estimated reasonably certain to be about 3400 years old
C. estimated at about 3400 years old with reasonable certainty,
D. estimated with reasonable certainty to be about 3400 years old,

Instructions for questions 33 and 34:
In the two questions that follow choose an ordering of the sentences labelled 1 to 5 that would form a coherent and logical piece of text.

Question 33.

1. Four days later, Oracle announced its own bid for PeopleSoft, and invited the firm’s board to a discussion.
2. Furious that his own plans had been endangered, PeopleSoft’s boss, Craig Conway, called Oracle’s offer “diabolical”, and its boss, Larry Ellison, a “sociopath”.
3. In early June, PeopleSoft said that it would buy J.D. Edwards, a smaller rival.
4. On June 12th, PeopleSoft turned Oracle down.
5. Moreover, said Mr. Conway, he “could imagine no price nor combination of price and other conditions to recommend accepting the offer.”

A. 31254  B. 23145  C. 45312  D. None of the others

Question 34.

1. Surrendered, or captured, combatants cannot be incarceraded in razor wire cages; this ‘war’ has a dubious legality.
2. The phrase ‘war against terror’, which has passed into the common lexicon, is a huge misnomer.
3. How can then one characterize a conflict to be waged against a phenomenon as war?
4. Besides, war has a juridical meaning in international law, which has codified the laws of war, imbuing them with a humanitarian content.
5. Terror is a phenomenon, not an entity-either State or non-State.
A. 24153  B. 25341  C. 52314  D. None of the others

Instructions for questions 35 to 38:

Read the passage below and answer questions 35 to 38 that follow. In each question you must choose the most appropriate answer in the context of the passage.

Social life is an outflow and meeting of personality, which means that its end is the meeting of character, temperament, and sensibility, in which our thoughts and feelings, and sense perceptions are brought into play at their lightest and yet keenest.

This aspect, to my thinking, is realized as much in large parties composed of casual acquaintances or even strangers, as in intimate meetings of old friends. I am not one of those superior persons who hold cocktail parties in contempt, looking upon them as barren or at best as very tryingly kaleidoscopic places for gathering, because of the strangers one has to meet in them; which is no argument, for even our most intimate friends must at one time have been strangers to us. These large gatherings will be only what we make of them - if not anything better, they can be as good places to collect new friends from as the slave-markets of Istanbul were for beautiful slaves or New Market for race horses.

But they do offer more immediate enjoyment. For one thing, in them one can see the external expression of social life in appearance and behaviour at its widest and most varied - where one can admire beauty of body or air, hear voices remarkable either for sweetness or refinement, look on elegance of clothes or deportment. What is more, these parties are schools for training in sociability, for in them we have to treat strangers as friends. So, in them we see social sympathy in widest commonality spread, or at least should. We show an atrophy of the natural human instinct of getting pleasure and happiness out of other human beings if we cannot treat strangers as friends for the moment. And I would go further and paraphrase Pater to say that not to be able to discriminate every moment some passionate attitude in those about us, even when we meet them casually, is on this short day of frost and sun which our life is, to sleep before evening.

So, it will be seen that my conception of social life is modest, for it makes no demands on what we have, though it does make some on what we are. Interest, wonder, sympathy, and love, the first two leading to the last two, are the psychological prerequisites for social life; and the need for the first two must not be underrated. We cannot make the most even of our intimate social life unless we are able to make strangers of our oldest friends everyday by discovering unknown areas in their personality, and transform them into new friends. In sum, social life is a function of vitality.

It is tragic, however, to observe that it is these very natural springs of social life which are drying up among us. It is becoming more and more difficult to come across fellow-feeling for human beings as such in our society - and in all its strata. In the poor middle class, in the course of all my life, I have hardly seen any social life properly so-called. Not only has the grinding routine of making a living killed all desire for it in them, it has also generated a standing mood of peevish hostility to other human beings. Increasing economic distress in recent years has infinitely worsened this state of affairs, and has also brought a sinister addition - class hatred. This has become the greatest collective emotional enjoyment of the poor middle class, and indeed they feel most social when they form a pack, and snarl or howl at people who are better off than they.

Their most innocent exhibition of sociability is seen when they spill out from their intolerable homes into the streets and bazaars. I was astonished to see the milling crowds in the poor suburbs
of Calcutta. But even there a group of flippant young loafers would put on a conspiratorial look if they saw a man in good clothes passing by them either on foot or in a car. I had borrowed a car from a relative to visit a friend in one of these suburbs, and he became very anxious when I had not returned before dusk. Acid and bombs, he said, were thrown at cars almost every evening in that area. I was amazed. But I also know as a fact that my brother was blackmailed to pay five rupees on a trumped up charge when passing in a car through one such locality.

The situation is differently inhuman, but not a whit more human, among the well-to-do. Kindliness for fellow human beings has been smothered in them, taken as a class, by the arrogance of worldly position.

Question 35. According to the author what are the primary requirements for an individual to have a good social life?
A. Attend large parties.
B. Have sympathy and love for others.
C. Have the psychological qualities of interest and wonder.
D. Develop ability to get happiness and pleasure from others.

Question 36. The closest meaning for the word ‘discriminate’ (underlined in passage) in the third paragraph is:
A. Recognize    B. Distinguish    C. Feel    D. Analyse

Question 37. According to the author the main reason social life is drying up is:
A. Not enough large parties.
B. The rich despise the poor.
C. There is very little fellow feeling in society.
D. The poor don’t have time.

Question 38. In the second last paragraph (starting “Their most innocent . . .”) the author wants to convey:
A. Poor areas of Calcutta are dangerous.
B. Social life is not possible without kindliness for others.
C. Poor people of Calcutta do not have a rich social life.
D. The class hatred the poor have for the rich.

Question 39. Find the word closest in meaning to INSIPID.
A. Quick    B. Tasteless    C. Diluted    D. Dirty

Question 40. Find the pair that best expresses the relation between the pair Harm : damage.
A. Sweet : sour    B. Stout : weak    C. Injure : incapacitate    D. Hook : crook
Part II: Elementary mathematics, computing, psychology and hypothesis testing

Question 41. A 5 meter long ladder is leaning against a vertical wall on perfectly level ground. As the bottom end of the ladder moves away from the wall at a speed of 2 meters per second, what is the speed at which the top end of the ladder is moving downwards at the moment when the top end is 3 meters above the ground?

A. 4 B. \( \frac{8}{3} \) C. 2\( \frac{1}{3} \) D. 1\( \frac{2}{3} \)

Question 42. Consider a function \( f(x) \) that has the following properties:

\[ f(1) = 3600 \]

For all \( n > 1 \), \( f(1) + f(2) + \ldots + f(n) = n^2 f(n) \)

Find the value of \( f(9) \)

A. 200 B. 120 C. 100 D. 80

Instructions for questions 43 and 44:

The two questions that follow are based on the following data:

Three men \( A \), \( B \) and \( C \) working together without a break can do a piece of work in 30 days. They start the work together and work according to the following schedule. \( A \) works for 3 days and rests on the fourth day, \( B \) works for 5 days and rests on the next two days and \( C \) works for 7 days and rests on the next three days.

Question 43. Assuming they all work at the same rate, in how many days will the work be completed?

A. 42 B. 41 C. 40 D. 39

Question 44. After how many days from the start will all of them be resting on the same day for the first time?

A. 47 B. 27 C. 23 D. 19

Question 45. A 2-digit number, say \( n \), is written in base 2 (that is binary notation), base 3 and base 5. The last digit in each case is 1 while the first digit is 1 only in two out of the three cases. The number is:

A. 91 B. 75 C. 63 D. 31

Question 46. In the figure below ABCDEF is a regular hexagon, AOF is a right angled triangle, where OF is parallel to the side ED and \( \angle AOF \) is 90°.
What is the ratio of the area of $\triangle AOF$ and hexagon ABCDEF?

A. $\frac{1}{24}$  B. $\frac{1}{18}$  C. $\frac{1}{16}$  D. $\frac{1}{12}$

**Question 47.** If $P$ and $Q$ are two $n \times n$ matrices then which of the following is true?

A. $P + Q \neq Q + P$  B. $(P^T)^T \neq P$  C. $PQ \neq QP$  D. A, B, C are all true

**Question 48.** Airports X and Y lie in different time zones. Y is located 3000Km west of X. The timetable for flights between X and Y is given below - local time.

<table>
<thead>
<tr>
<th>Departure</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
<td>08.00</td>
</tr>
<tr>
<td>X</td>
<td>16.00</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Arrival</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>15.00</td>
</tr>
<tr>
<td>Y</td>
<td>20.00</td>
</tr>
</tbody>
</table>

Assuming the planes in both directions travel at the same air speed and there is always a tail wind of 50Km/hr from east to west. What is the time difference between X and Y.

A. 2 hours  B. 1 hour 30 mins  C. 1 hour  D. Cannot be calculated

**Question 49.** Let $z = (\log_2 x)^2 - 6 \log_2 x + 12$ where $x$ is a real number. Then the equation $x^z = 256$ has how many solutions for $x$?

A. No solution for $x$.  
B. Exactly one solution for $x$.  
C. Exactly two distinct solutions for $x$.  
D. Exactly three distinct solutions for $x$.

**Question 50.** You have 10 distinct integers $n_1$ to $n_{10}$. How many triples $(n_i, n_j, n_k)$ can be formed such that $n_i < n_j < n_k$?

A. 60  B. 90  C. 120  D. 150

**Question 51.** Which of the following is a true difference between an algorithm and a program.

A. A program must be expressed in some programming language an algorithm is always written in some kind of pseudo code.  
B. A program must be precise but an algorithm need not be.  
C. A program need not terminate an algorithm must terminate.  
D. Algorithms fall into different paradigm classes (like divide-and-conquer, greedy etc.) programs do not.

**Question 52.** The logical formula $(A \ X OR \ B)$ is equivalent to which of the following?

A. $\neg A \ OR \ \neg B$  
B. $\neg A \ AND \ \neg B$  
C. $(\neg A \ OR \ B) \ AND \ (A \ OR \ \neg B)$  
D. $(\neg A \ AND \ B) \ OR \ (A \ AND \ \neg B)$
1: function TEST1(a, b) \[\triangleright a, b \text{ are integers}\]
2: if \((b == 0)\) then
3: return a
4: else
5: return TEST1(b, a \% b) \[\triangleright \% \text{ is the remainder operation}\]
6: end if
7: end function

Instructions for questions 53 and 54:
Study the function written above in pseudo code and answer the questions that follow:

Question 53. What will be the output of \(TEST1(120, 96)\)?
A. 120 B. 96 C. 24 D. 12

Question 54. If each call of the function \(TEST1\) takes up two bytes of memory how much memory is used in calculating \(TEST1(33, 132)\)?
A. 2 B. 4 C. 6 D. 8

Instructions for questions 55 and 56
Study the program written in pseudo code below and answer the questions that follow.

1: function TEST(a, b, c, d, e, n) \[\triangleright a,b,c,d,e \text{ are distinct integers}\]
2: if \((a > b)\) then
3: return TEST(b, a, c, d, e, n + 1)
4: else if \((b > c)\) then
5: return TEST(a, c, b, d, e, n + 1)
6: else if \((c > d)\) then
7: return TEST(a, b, c, d, e, n + 1)
8: else if \((d > e)\) then
9: return TEST(a, b, c, e, d, n + 1)
10: else
11: return (c, n)
12: end if
13: end function

Question 55. What will be printed when we execute \(print(TEST(8, 6, 4, 2, 1, 0))\)?
A. (2, 11) B. (4, 11) C. (4, 10) D. (2, 10)

Question 56. What is the best description of what the program is doing?
A. Finds second largest number of \(a\) to \(e\) and the number of times \(TEST\) is called.
B. Finds the median element of \(a\) to \(e\) and the number of recursive calls to \(TEST\).
C. Finds the median element of a to e and the number times TEST is called.
D. Finds the second largest element of a to e and the number of recursive calls to TEST.

Question 57. Briefly, Pavlovian conditioning is:
A. modification of behavior by reinforcement.
B. an anticipatory biological response.
C. learning from the effects of behavior.
D. establishing a connection between behavior and its consequences.

Question 58. A tone which predicts a puff of air elicits an eyeblink. What is the puff of air?
A. The UCR (unconditioned response).
B. The CS (conditioned stimulus).
C. The CR (conditioned response).
D. The UCS (unconditioned stimulus).

Question 59. Fill the blank in the sentence below:
In visual search if target differs from the distractor by more than one feature (conjunction search) the time spent to find out the target ............. with the number of items on display.
A. decreases  B. remains same  C. increases  D. may or may not change

Question 60. Perceptual constancy is reduced by:
1. Limited experience with the object in question.
2. Decreasing number of environmental cues that help identify the object.
Which of the following is true?
A. Both 1 and 2. B. Only 1. C. Only 2. D. Neither 1 nor 2.

Instructions for questions 61 to 63 below.
Study the information and figure given below and answer the questions that follow.

Imagine an observer performing a 2AFC (two alternatives forced choice) task where they are presented with a shade of grey and they have to press one button to categorise the colour as white, or another button to categorise the colour as black. Intuitively, they are more likely to classify a grey stimulus as black the closer it is to black, and less likely the closer it is to white. We run this experiment in three conditions, one with stimuli presented on a white background, one with stimuli presented on a black background, and one with stimuli presented on a gray background but obscured by a blur filter. The results are plotted as circles, squares and diamonds on the graph below.
Question 61. Which condition causes the greatest bias in the observer?
A. Data plotted with diamond    B. Data plotted with squares    C. Data plotted with circles
D. Inadequate information

Question 62. For which condition does the observer have the least perceptual sensitivity?
A. Data plotted with diamond    B. Data plotted with squares    C. Data plotted with circles
D. Inadequate information

Question 63. Identify the data set that corresponds to the experimental condition “the observer has greatest natural familiarity”?
A. Data plotted with diamond    B. Data plotted with squares    C. Data plotted with circles
D. Inadequate information

Question 64. In linguistics, transformational rules:
A. transform ideas to text.
B. transform deep structure to surface structure.
C. transform text in one language to text in another language.
D. transform objects to symbolic representations.

Question 65. Damage to which of the following structures would be expected to impair instrumental (operant) conditioning:
A. Amygdala    B. Hypothalamus    C. Basal Ganglia    D. Frontal cortex

Question 66. Most often, when both type I and type II errors are present which is/are considered more serious?
A. Neither is serious.    B. Both are serious.    C. Type II is serious.    D. Type I is serious.
**Question 67.** The hypothesis that an analyst is interested in establishing is
A. the null hypothesis
B. the optional hypothesis
C. the elective hypothesis
D. the alternative hypothesis

**Question 68.** The p-value in hypothesis testing represents which of the following: Select the best answer from those below.
A. The probability of failing to reject the null hypothesis, given the observed results
B. The probability that the null hypothesis is true, given the observed results
C. The probability that the observed results are statistically significant, given that the null hypothesis is true
D. The probability of observing results as extreme or more extreme than currently observed, given that the null hypothesis is true

**Question 69.** The power of a test is related to:
A. Type I error
B. Type II error
C. Both Type I and Type II errors
D. Neither type I nor type II errors

**Question 70.** As sample size increases how does the standard error of the mean change?
A. Increases  B. Decreases  C. Remains unchanged  D. Not enough information to say

**Question 71.** If $\mu$ is the population mean then $Z = \frac{\bar{X} - \mu}{\sigma/\sqrt{n}}$ is distributed as:
A. a standard normal variable if the population is non-normal
B. a standard normal variable, if the population is large
C. a standard normal variable, if the population is normal
D. the t-distribution with $\nu = n - 1$ degrees of freedom

**Question 72.** Student’s t-test is applicable only when (where $n$ is sample size and $\sigma$ is the population standard deviation):
A. $n < 30$ ($n$ is less than 30) and $\sigma$ is known
B. $n > 30$ ($n$ is greater than 30) and $\sigma$ is unknown
C. $n = 30$ ($n$ is exactly 30) and $\sigma$ is known
D. All of the previous