COGNITIVE SCIENCE QUALIFYING TEST - 2020

Instructions:

1. The paper has a total of 80 multiple choice questions (MCQ) in 16 pages (8 sheets of paper) including this page.

2. The total time available is 180 minutes.

3. The questions are divided into Part I: 40 general aptitude questions (distributed between quantitative, reasoning, data interpretation and comprehension) and Part II: 40 questions divided into a) psychology and hypothesis testing b) mathematics and computation (c) neuroscience and life sciences and (d) linguistics and philosophy.

4. **No paper of any kind (except your interview letter and original ID proof) or any electronic gadget is allowed in the examination hall.**

5. **Answers should be marked on the separate answer sheet provided.**

6. **Each question has 4 possible answers. There is only ONE correct or the closest approximate or appropriate answer.**

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

8. **Ensure that you write your COGJET application number and name in the answer sheet**.

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

10. Return the answer sheet, question paper and any rough sheets at the end of the test.

Part I

Question 1. I'm facing south. I now turn in an anticlockwise direction through an angle of 135°. Then I take an about turn and turn through an angle of 45° to my right. Which direction I am facing now?

A. East   **B. West**   C. North   D. South

Question 2. Of the four alternatives given in the question, find the one, which is different from the rest.

A. Hawk-Pigeon   B. Lion-Deer   **C. Cow-Hen**   D. Cat-Mouse

Question 3. Tailor is to cloth as farmer is to _____

A. Crop   B. Plough   C. Spade   **D. Land**

Question 4. Which of the following alphabet triplets comes next in the series: ABP:CDQ: EFR:_____

A. GHS   B. GHT   C. HGS   D. GHR

Question 5. Solve the following: 987×3923 is closest to

A. 38,72,001   B. 38,76,005   C. 38,79,670   D. 38,73,998

Question 6. 2^{60} is closest to

A. 10^{15} **B. 10^{18}**   C. 10^{21} D. 10^{24}

Question 7. What is 23^5

A. 1832479   B. 1742981   C. 1419857   D. 52393487

Note: There was a printing error in Q7. The question should have asked for 17^5 instead of 23^5. All candidates will be given full marks for Q7, whether they attempted it or not.

Question 8. Two boys drinking two separate health drinks for two months are able to solve maths problems with different levels of success. One boy gets 96 in the exam and the other gets 86. From these observations, we can conclude that one of the health drinks

       A. is probably no different than the other

       B. might be improving math performance

       C. definitely improves math performance

       D. none of the above

Question 9. A medical treatment has a 30% success rate on average. A doctor tells me that repeating the treatment twice would make the likelihood of success 60%.

       A. Yes, the doctor is right

       B. No, it would make the likelihood of success only 51%

       C. No, we can't say what the likelihood could be

       D. No, we can only say that the likelihood will be better than before, but not by how much

Question 10. In a certain house, each member was either a conservative or a liberal. One day one of the liberals decided to become a conservative, and after this happened, there was the same number of conservatives as liberals. A few weeks later, the new conservative decided to become a liberal again, and so things were back to normal. Then another conservative decided to become a liberal, at which point there were twice as many liberal as conservatives. How many members did the house contain?

A. 11   **B. 12**   C. 10   D. 14

Question 11. While entering the COGJET exam, 14 people entered the exam hall before Krishna, 7 people entered between Krishna and Radha, and 10 people entered after Radha. How many people entered the exam hall?

A. 31   B. 33   C. 19   **D. cannot be determined**

The graph below shows marks received in the 10th class Board exams by the students in a school. Error bars show standard deviations. Please use this graph to answer questions 12 to 15 below.
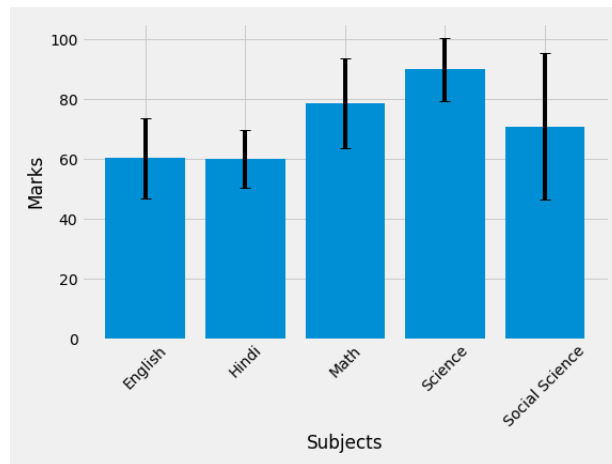
Question 12. Irfan got 85 marks in science. What would be his percentile rank in this batch of students?

A. 50th percentile

B. below 50th percentile

C. above 50th percentile

D. cannot be determined

Question 13. Which subject is expected to have the most failing students, assuming the pass cutoff is 40 marks per subject?

A. English

B. Hindi

C. Math

D. Social Science

Question 14. A selective high school wants to set cutoffs for its Science and Arts stream entry on Science and Social Science respectively. Which cutoff should be higher, assuming they want students of equal merit in both streams?

A. Science

B. Social Science

C. Use a rank order cutoff

D. Use a cutoff based on z-scores

Question 15. What would be an average student's total marks in the Board exam?

A. 355

B. 350

C. 345

D. Cannot be determined

The graph below plots the average daily high temperature for months of the year measured in four different cities of India. Please use this graph to answer questions 16 to 19 below.
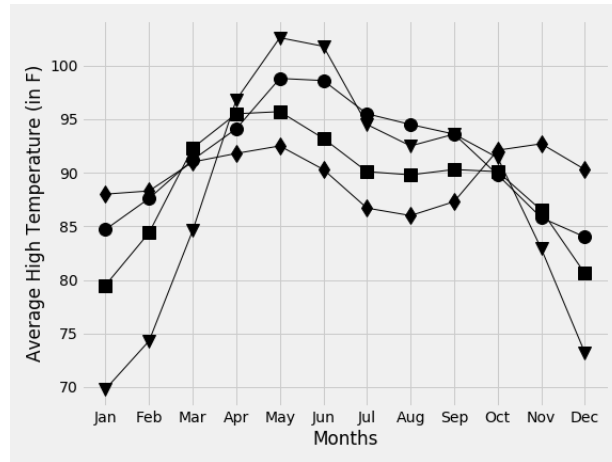
Question 16. Which is the coolest city of the four, on average?

A. Diamond   B. Square   **C. Triangle**   D. Circle

Question 17. In which city are people least likely to own warm clothes?

A. Diamond   B. Square   C. Triangle   D. Circle

Question 18. Which city is farthest from the sea?

A. Diamond   B. Square   **C. Triangle**   D. Circle

Question 19. In which month is the average high temperature across all the cities the most similar?

A. March   B. April   C. September   **D. October**

Questions 20 to 23 are based on the passage below.

There is a fundamental difference between the appeal of a mass movement and the appeal of a practical organization. The practical organization offers opportunities for self-advancement, and its appeal is mainly to self-interest. On the other hand, a mass movement, particularly in its active, revivalist phase, appeals not to those intent on bolstering and advancing a cherished self, but to those who crave to be rid of an unwanted self. A mass movement attracts and holds a following not because it can satisfy the desire for self-advancement, but because it can satisfy the passion for self-renunciation.

People who see their lives as irremediably spoiled cannot find a worth-while purpose in self-advancement. The prospect of an individual career cannot stir them to a mighty effort, nor can it evoke in them faith and a single-minded dedication. They look on self-interest as on something tainted and evil; something unclean and unlucky. Anything undertaken under the auspices of the self seems to them foredoomed. Nothing that has its roots and reasons in the self can be good and noble. Their innermost craving is for a new life - a rebirth - or, failing this, a chance to acquire new elements of pride, confidence, hope, a sense of purpose and worth by an identification with a holy cause. An active mass movement offers

them opportunities for both. If they join the movement as full converts they are reborn to a new life in its close-knit collective body, or if attracted as sympathizers they find elements of pride, confidence and purpose by identifying themselves with the efforts, achievements and prospects of the movement. To the frustrated a mass movement offers substitutes either for the whole self or for the elements which make life bearable and which they cannot evoke out of their individual resources.

It is true that among the early adherents of a mass movement there are also adventurers who join in the hope that the movement will give a spin to their wheel of fortune and whirl them to fame and power. On the other hand, a degree of selfless dedication is sometimes displayed by those who join corporations, orthodox political parties and other practical organizations. Still, the fact remains that a practical concern cannot endure unless it can appeal to and satisfy self-interest, while the vigor and growth of a rising mass movement depend on its capacity to evoke and satisfy the passion for self-renunciation. When a mass movement begins to attract people who are interested in their individual careers, it is a sign that it has passed its vigorous stage; that it is no longer engaged in molding a new world but in possessing and preserving the present. It ceases then to be a movement and becomes an enterprise. According to Hitler, the more "posts and offices a movement has to hand out, the more inferior stuff it will attract, and in the end these political hangers-on overwhelm a successful party in such number that the honest fighter of former days no longer recognizes the old movement.... When this happens, the 'mission' of such a movement is done for."

(Excerpted from Eric Hoffer's *The True Believer*)

Question 20. "Anything undertaken under the auspices of the self seems to them foredoomed". People that answer to such a description, when faced with a practical problem, would likely

    A. Try to solve it themselves, or ask for help in solving it from friends

    B. Write petitions to people in authority, asking for help in solving the problem

    C. Find people facing similar problems, and ask for help on everyone's behalf

    D. Try to work around the problem, since the personal self's preferences should be renounced

Question 21. According to Hoffer, where are mass movements most likely to emerge?

    A. In socioeconomic systems that provide opportunity for self-advancement for everyone

    B. In socioeconomic systems that provide opportunity for self-advancement for no one

    C. In socioeconomic systems that provide opportunity for self-advancement for a few, but not for most

    D. In socioeconomic systems that provide opportunity for self-advancement for most, excepting a few

Question 22. What would disprove Hoffer's hypothesis about the difference between mass movements and practical organizations?

    A. The successful survival of some mass movements over centuries, continually attracting new adherents, while enterprises come and go

    B. Discovering that most leaders of mass movements are self-interested, and not interested in self-renunciation

    C. The presence of large number of people claiming self-renunciation as their primary operating principle in practical organizations

    D. The presence of large number of people claiming self-interest as their primary operating principle in mass movements

Question 23. What is Hoffer's opinion about Hitler's diagnosis of what destroys mass movements?

    A. There is inadequate information in the passage to assess Hoffer's view on Hitler's position

    B. He agrees with Hitler that mass movements lose their energy once they start attracting self-interested adherents

    C. He disagrees with Hitler, suggesting that it is not posts and offices, but whether a deeper yearning for self-renunciation is fulfilled that determines the success or failure of mass movements

    D. He agrees with Hitler that all mass movements start out as a cause, eventually become a business, and finally end up as rackets

Questions 24 to 27 are based on the passage below.

. . . there's nothing common about common sense. Somehow it must find its way into a human or robot brain. And common sense is not simply an almanac about life that can be dictated by a teacher or downloaded like an enormous database. No database could list all the facts we tacitly know, and no one ever taught them to us. You know that when Irving puts the dog in the car, it is no longer in the yard. When Edna goes to church, her head goes with her. If Doug is in the house, he must have gone in through some opening unless he was born there and never left. If Sheila is alive at 9 A.M. and is alive at 5 P.M., she was also alive at noon. Zebras in the wild never wear underwear. Opening a jar of a new brand of peanut but-ter will not vaporize the house. People never shove meat thermometers in their ears. A gerbil is smaller than Mt. Kilimanjaro.

An intelligent system, then, cannot be stuffed with trillions of facts. It must be equipped with a smaller list of core truths and a set of rules to deduce their implications. But the rules of common sense, like the categories of common sense, are frustratingly hard to set down. Even the most straightforward ones fail to capture our everyday reasoning. Mavis lives in Chicago and has a son named Fred, and Millie lives in Chicago and has a son named Fred. But whereas the Chicago that Mavis lives in is the same Chicago that Millie lives in, the Fred who is Mavis' son is not the same Fred who is Millie's son. If there's a bag in your car, and a gallon of milk in the bag, there is a gallon of milk in your car. But if there's a person in your car, and a gallon of blood in a person, it would be strange to conclude that there is a gallon of blood in your car.

Even if you were to craft a set of rules that derived only sensible conclusions, it is no easy matter to use them all to guide behavior intelligently. Clearly a thinker cannot apply just one rule at a time. A match gives light; a saw cuts wood; a locked door is opened with a key. But we laugh at the man who lights a match to peer into a fuel tank, who saws off the limb he is sitting on, or who locks his keys in the car and spends the next hour wondering how to get his family out. A thinker has to compute not just the direct effects of an action but the side effects as well.

But a thinker cannot crank out predictions about all the side effects, either. The philosopher Daniel Dennett asks us to imagine a robot designed to fetch a spare battery from a room that also contained a time bomb. Version 1 saw that the battery was on a wagon and that if it pulled the wagon out of the room, the battery would come with it. Unfortunately, the bomb was also on the wagon, and the robot failed to deduce that pulling the wagon out brought the bomb out, too. Version 2 was programmed to consider all the side effects of its actions. It had just finished computing that pulling the wagon would not change the color of the room's walls and was proving that the wheels would turn more revolutions than there are wheels on the wagon, when the bomb went off. Version 3 was programmed to distinguish between relevant implications and irrelevant ones. It sat there cranking out millions of implications and putting all the relevant ones on a list of facts to consider and all the irrel-evant ones on a list of facts to ignore, as the bomb ticked away.

(Excerpted from Steven Pinker's *How the Mind Works*)

Question 24. In the first paragraph, 'tacitly' is closest in meaning to

    A. Intuitively obvious

    B. Hard to express

    C. To some extent, but not completely

    D. In an associative sense

Question 25. What point does Pinker make using Dan Dennett's story?

    A. Robots should not be asked to do dangerous things, because they may spend too much time thinking things through

    B. Expecting robots to think common-sensically is unrealistic

    C. Explicit representations of world knowledge are inadequate for realistic common sense reasoning

    D. Robots are unable to reason efficiently about the side effects of potential actions

Question 26. If there's a person in the car, and a gallon of blood in the person, why is it strange to conclude that there is a gallon of blood in the car?

    A. Because social convention suggests otherwise

    B. Because no apparent functional purpose is served by this description

    C. Because the gallon of blood is unobservable

    D. Because it is communicatively more efficient to say that there is a person in the car

**Question 27**. What does Pinker mean by saying "there is nothing common about common sense"?

    A. It is difficult to understand how common sense actually works

    B. Very few people actually have common sense

    C. Common sense is actually a very small fraction of the set of knowledge patterns that humans use while thinking

    D. The mind privileges common sense over other modes of thinking

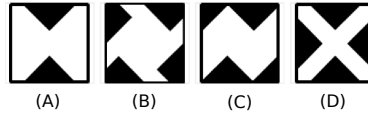**Question 28**. Pick the piece that's missing from the diagram shown below

    (A)   (B)   (C)   (D)
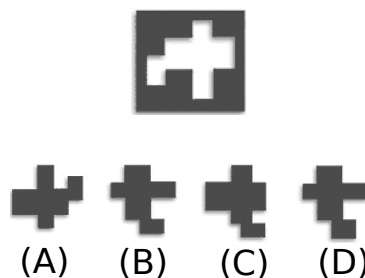
    A. (A)   **B. (B)**   C. (C)   D. (D)

Question 29. Which symbol will be on the face opposite to the face with symbol 'C' ?
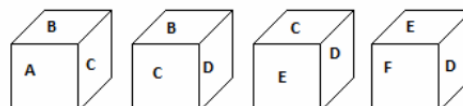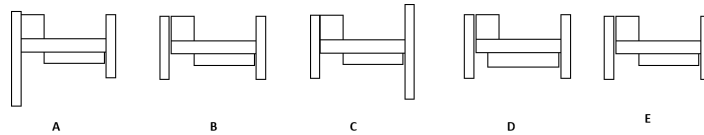

    A. D   B. E   C. B or D   **D. F**

Question 30. Choose the image that completes the pattern
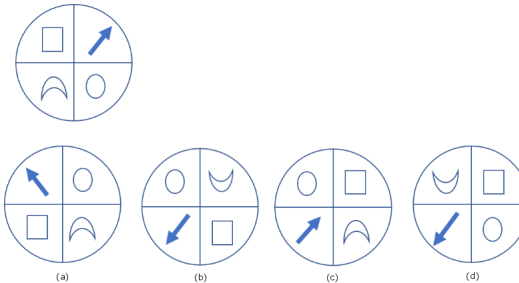

A. (A)   B. (B)   C. (C)   **D. (D)**

Question 31. Which two of the five pictures are identical?
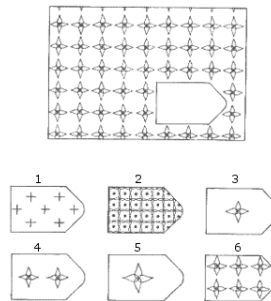

A. A and B   **B. B and E**   C. C and D   D. A and E

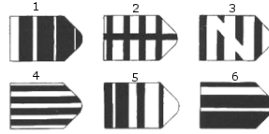**Question 32**. Counter clockwise rotation of the circle by 180 degrees gives

A. (a)   **B. (b)**   C. (c)   D. (d)

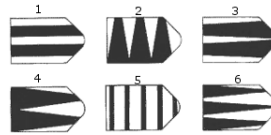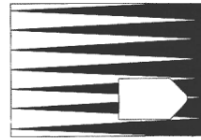**Question 33**. Complete the pattern with one of the pieces

A. 2   B. 4   **C. 6**   D. 3
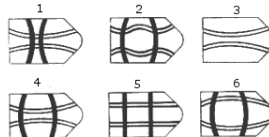
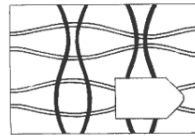**Question 34**. Complete the pattern with one of the pieces

A. 1   B. 3   C. 5   D. 6

Question 35. Complete the pattern with one of the pieces

A. 1   **B. 3**   C. 5   D. 6

Question 36. Complete the pattern with one of the pieces

A. 2   **B. 4**   C. 5   D. 6

Question 37. What number will follow in the series 5, 13, 32, _____

A. 51   B. 40   C. 69   D. 72

Note: There was a printing error in Q37. The first term in the sequence was to have been 6. All candidates will be given full marks for Q7, whether they attempted it or not.

Question 38. What number will follow in the series 8, 5, 4, 9, 1, _____

A. 9   B. 2   **C. 10**   D. 3

Question 39. philately: stamps :: teleology: _____

A. knowledge   B. wisdom   **C. purpose**   D. reason

Question 40. stars: astronomer :: airplanes: _____

A. pilot   **B. AT controller**   C. physicist   D. engineer

Part II

Question 41. A and B run a km race. If A gives B a start of 100 m, A wins by 20 sec and if A gives B a start of 50 sec, B wins by 30 m. The time taken by A to run a km is

A. 196.85 seconds   B. 218.85 seconds   C. 234.94 seconds   D. 236.94 seconds

Question 42. Of the 200 candidates who were interviewed for a position, 100 had a two-wheeler, 70 had a credit card and 140 had an iphone. 40 of them had both, a two-wheeler and a credit card, 30 had both, a credit card and an iphone and 60 had both, a two wheeler and iphone and 10 had all three. How many candidates had none of the three?

A. 0   B. 20   **C. 10**   D. 18

Question 43. I have 5 Rock songs, 6 Carnatic songs and 3 Indi pop songs. How many different albums can I form using the above repertoire if the albums should contain at least 1 Rock song and 1 Carnatic song?

A. 15624   B. 16384   C. 6144   D. 240

Question 44. A sphere is inscribed inside a cube with edges of 6 cm. In cubic centimeters, what is the volume of the sphere, in terms of π?

A. 12π **B. 36π**   C. 48π D. 288π

Question 45. If $\mathbf{A}$ and $\mathbf{B}$ are square matrices of size 4×4 such that $\mathbf{A} = 5\mathbf{B}$ and $|\mathbf{A}| = \alpha|\mathbf{B}|$, then α is

A. 5   B. 25   C. 125   **D. 625**

Question 46. For what interval is the function $f(x) = x^4 - 2x^2$ decreasing?

A. $(-1, 1)$ B. $(-1, \infty)$ **C. $(-\infty, -1) \cup (0, 1)$**   D. $(-\infty, 0) \cup (1, \infty)$

Question 47. The odds against a husband who is 45 years old, living till he is 70 are 7 : 5 and the odds against his wife who is 36, living till she is 61 are 5 : 3. The probability that atleast one of them will be alive 25 years hence, is

A. 61/96   B. 5/32   C. 13/64   D. 62/97

Question 48. A book contains 100 pages. A page is chosen at random. What is the chance that the sum of the digits on the page is equal to 8?

A. 0.08   **B. 0.09**   C. 0.90   D. 0.10

Question 49. The temperature T (in degrees Fahrenheit) of a room at time t minutes is given by $T = 85 - 3\sqrt{25 - t}$, for $0 \le t \le 25$ minutes. Then the room's average temperature for these 25 minutes is

A. 73° F   B. 63° F   C. 80° F   **D. 75° F**

Question 50. A polygon has 44 diagonals. How many sides does it have?

A. 8   B. 9   C. 10   **D. 11**

Question 51. A linear array, named SUBJECT, has n elements. Suppose the element C appears randomly in the array and there is a linear search to find the location K of C. Let f(n) denote the number of comparisons in the linear search. The maximum value (worst case) of f(n) is of the order of:

A. n^2 B. K^2 **C. n**   D. $\log n$

Answer questions 52 and 53 using the following tree
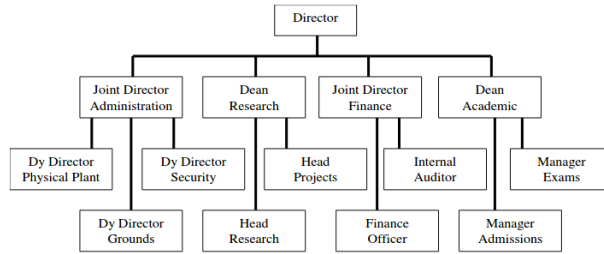
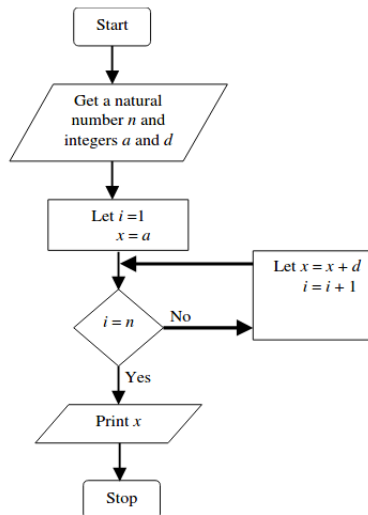**Question 52**. How many leaf nodes are there in the tree?

    A. 4   B. 13   C. 14   **D. 9**

Question 53. How many nodes have odd degree in the tree?

    A. 0   **B. 1**   C. 2   D. 4

Answer questions 54 and 55 using the following flowchart

Question 54. What is the output of the program in the flowchart for n = 6, a= −20, d= 4?

    A. 0   B. 4   C. -4   D. 40

Question 55. What does the program calculate?

    A. Arithmetic progression   B. Geometric progression   C. Sum of n natural numbers   D. None of the above

Use the following pseudocode to answer questions 56 and 57

Consider the following recursive function where n is a non-negative integer:

```
function recur(n: nonnegint):nonnegint;
    begin
        if n = 0 then
            recur:=0
        else
            recur := n + recur(n -1)
    end;
```

Question 56. What value will recur return when it is invoked with n= 10?

    A. 0   B. 11   **C. 55**   D. 45

Question 57. What does the program calculate?

    A. Arithmetic progression   B. Geometric progression   **C. Sum of n natural numbers**   D. None of the above

Question 58. How many divisible parts occur in the following word: *deunionization*

    A. 2   B. 3   **C. 4**   D. 6

Question 59. Choose which of the following languages is correctly grouped together based on their language family

    A. Kannada, Telugu, Tamil, Tulu

    B. French, English, German, Dutch

    C. Bangla, Hindi, Marwari, Santhali

    D. Spanish, Irish, Italian, Portuguese

Question 60. Choose the correct statement among the options below

    A. Vowels are produced with restriction in the oral cavity

    B. Sign languages have grammar

    C. Prepositions are a type of content word

    D. Sound and meaning are directly related

Question 61. Consider the following sentences:

A: I really love big mugs of hot chocolate milk on cold wintry mornings.
B: Big mugs of hot chocolate milk I really love on cold wintry mornings.
C: Mugs I really like big of hot chocolate milk on cold wintry mornings.

The bad sentence (C) shows that human language speakers only displace _____ within sentences.

    A. Constituents

    B. Words

    C. Phrases

    D. Phones

Question 62. Consider the following sentences from Swahili. (Gloss: SM = subject marker)

1.Juma a-li-nunua mkate

Juma SM-past-buy bread

Juma   bought   bread

2.puma pa-ni-huongea gereza

Dog   loves   meat

The dog   loves   meat

Choose the right gloss for the inflectional marker combination *pa-ni* in (2).

      A. SM-present tense

      B. present tense-SM

      C. SM-past tense

      D. past tense-SM

Question 63. The cocktail party phenomenon refers to

      A. the role of attention in feeling intoxicated

      B. the effect of being accompanied by people on alcohol consumption

      C. the effect of alcohol on assertiveness and extraversion

      D. the ability to focus on any one conversation in a cocktail party

Question 64. Which of these is guaranteed to change with the number of samples drawn from a random distribution

      A. Mean

      B. Median

      C. Standard error

      D. Standard deviation

Question 65. Declarative memory deals with

      A. Facts and performance

      B. Actions and knowledge

      C. Facts and episodes

      D. Episodes

Question 66. An experimenter finds that animals with brain lesions perform at the same level as animals without lesions on two simple mazes; but on a third more complicated maze, animals without lesions perform better than lesioned animals. This finding is an example of the statistical concept of

      A. Randomization

      B. Interaction

      C. Regression

      D. Central tendency

Question 67. The characteristic shape of a psychometric curve is

      A. Sigmoidal

      B. Gaussian

      C. Hyperbolic

      D. Exponential

Question 68. If I toss a coin three times, what is the variance of the probability distribution representing my uncertainty about the total number of heads seen?

    A. 0.5   **B. 0.75**   C. 1   D. 1.25

Question 69. If X is normally distributed with mean 5 and variance 10, what is the variance of the variable $Y = 2X + 5$?

    A. 10   B. 20   C. 30   **D. 40**

Question 70. I try to remember a phone number and fail. Then, next morning, I suddenly remember it without even trying. This is an example of

A. Cued recall   **B. Free recall**   C. Serendipitous recall   D. Cued recognition

Question 71. A change in the membrane potential in which the electrical current inside the cell becomes less negative is called

A. Hyperpolarization   B. Repolarization   C. Resting potential   **D. Depolarization**

Question 72. Which neurons have afferent axons?

A. Motor neurons   B. Glial cells   **C. Sensory neurons**   D. Interneurons

Question 73. Which neurotransmitter's receptors are usually involved in long-term potentiation?

A. Serotonin   B. Dopamine   **C. Glutamate**   D. GABA

Question 74. The hyperpolarization phase of the action potential is due together

A. The opening of voltage-gated Cl^- channels

B. The opening of voltage-gated K^+ channels

C. The closure of resting Na^+ channels

D. The closure of Cl^- channels

Question 75. Cerebrospinal fluid circulates around the brain between the

A. skull and dura mater

B. dura mater and arachnoid mater

C. arachnoid and pia mater

D. pia mater and brain surface

Question 76. Neuromodulators that act to reduce or eliminate perception of pain are called

A. catecholamines

B. endorphins

C. GABA

D. BDNF

Question 77. Following a stroke, a patient shows diminished sensitivity to touch in the right leg. The probable site of the lesion is the

A. left parietal lobe

B. left occipital lobe

C. right occipital lobe

D. right parietal lobe

Question 78. Q1. Ths question is based on the following argument that mental states and brain states are distinct:

'Mental states are introspectively known to me. Brain states are not introspectively known to me. Therefore my mental states are not identical with my brain states.'

A material reductionist's (or type physicalist's) position on the above will be:

A. Mental states are not known to me

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B. The argument is correct

C. A mental state is equivalent to a set of brain states so the argument is wrong

D. Brain states are also introspectively known

Question 79. Descartes argument for dualism is summarized below:

'An individual has a clear and distinct idea of his/her mind as a thinking thing that has no spatial extension. He/she also has a clear and distinct idea of his/her body as something that is spatially extended, subject to measurement and quantification and not able to think. It follows that mind and body are not identical because they have radically different properties.'

The truth of which of the following propositions in the argument will a NON-DUALIST most likely claim is in doubt:

A. Individuals' clear and distinct ideas are necessarily true.

B. Mind has no spatial extension.

C. Individual has clear and distinct idea that his/her body has spatial extension and is quantifiable.

D. Body is not able to think.

Question 80. Which of the following best characterizes the central thesis of the representational theory of mind:

A. The mind is like a computer.

B. The mind is the software that executes on the brain as hardware.

C. The mind is the set of processes that work with neural representations.

D. The mind works with abstract symbolic representations that have semantic properties.

ROUGH WORK