

ACHARYA UNIVERSITY

SAMPLE QUESTION PAPER

Name: _____
 Max. Points: 100

Application Reference Number: AU23
 Duration: 3 Hours.

Instructions:


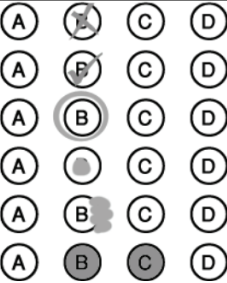
This examination will be graded by a computer. It is therefore important to read and follow these instructions to ensure that the Multiple-Choice Question (MCQ) answer sheet is marked properly by the computer.

Read the following instructions and refer to the example below as a guide:

- All your answers to the multiple-choice questions must be marked on the answer sheet provided. After the examination, your answer sheet will be scanned and then graded by the computer. Anything written on the question booklet will not be taken into consideration for assessment purposes.
- Before you start the examination, check that your answer sheet is free from printing defects, i.e. Misaligned contents, faded print, missing print, repetitive defects, smeared or smudged. Ask the invigilator to replace your answer sheet if it has printing defects.
- In the upper section, clearly fill the requested information, including your Name and Application Reference Number.
- Read each question carefully. Using a Black Ball point pen, fill in the circle corresponding to the letter of the correct answer.
 - Do NOT tick, circle, cross, or underline the circles. An incorrect mark may produce improper results during computer marking.
 - Fill only ONE circle for EACH question. If more than one circle is filled in for a single question, your answer for that question will be invalid.
- Avoid unnecessary marks on the answer sheet. Stray marks on or near the circles may affect your score.
- Do NOT fold or crease your answer sheet.
- Each question carries one point.
- One point for each correct answer.
- No negative point for an incorrect answer.
- Candidate should not open the seal of the question paper booklet before the time specified for the commencement of the examination.

Example:

Question: The sun rises in the (a) north (b) east (c) west (d) south

Correct Method	Wrong Method
<div style="text-align: center;">  </div> <p>Note that: The scanning system evaluates filled-in circles on the sheet.</p>	

PART-A
MATHEMATICS

1. The value of $\lim_{x \rightarrow 5} \frac{x-5}{x^2-25}$ is
a) -10 b) $-\frac{1}{10}$ c) $\frac{1}{10}$ d) 10
2. The value of $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\tan x}{2 \tan x - \sqrt{3}}$ is
a) $\frac{1}{\sqrt{3}}$ b) $\frac{\sqrt{3}}{2}$ c) 1 d) 3
3. The value of $\lim_{x \rightarrow \frac{\pi}{2}} \frac{1}{2 + \sin x}$ is
a) $\frac{1}{2}$ b) $\frac{1}{3}$ c) 1 d) none of these
4. If $y = e^{\sqrt{7}}$ then the derivative is
a) $y' = \frac{e^{\sqrt{7}}}{2\sqrt{7}}$ b) $y' = \frac{e^{\sqrt{7}}}{\sqrt{7}}$ c) $y' = e^{\sqrt{7}}$ d) $y' = 0$
5. If $y = \ln(\sin 3x)$ then the derivative is
a) $y' = 3 \cot 3x$ b) $y' = 3 \cot x$ c) $y' = \cot 3x$ d) $y' = -3 \cot 3x$
6. The first derivative of $y = 2 \tan x$ is
a) $2 \sec^2 x$ b) $2 \sec^2 x \tan x$ c) $4 \sec^2 x \tan x$ d) $4 \sec x \tan x$
7. If $f(x) = x^3 - \frac{1}{x^3}$, then $f'(x) =$
a) $x^2 - \frac{1}{x^2}$ b) $3x^2 + 3$ c) $3x^2 + \frac{3}{x^4}$ d) $1 + \frac{1}{x^4}$
8. The first derivative of $y = \ln(\cos x)$ is
a) $y' = -\frac{\cot x}{\csc x}$ b) $y' = -\cot x$ c) $y' = -\cot x \cot x$ d) $y' = -\cot x$
9. The derivative of $y = \ln 5$ is
a) $y' = \frac{1}{5}$ b) $y' = 0$ c) $y' = 5$ d) none of these
10. The slope of the tangent line of the function $y = \sqrt{x^2+5}$, at $x = 2$ is
a) $\frac{1}{3}$ b) $\frac{2}{3}$ c) $\frac{1}{2}$ d) 2
11. Integrate: $x^3 + x$
a) $\frac{x^4}{4} + \frac{x^2}{2} + c$ b) $\frac{x^4}{4} - \frac{x^2}{2} + c$ c) $\frac{x^4}{4} + \frac{x^2}{2} + c$ d) $\frac{x^3}{4} + \frac{x^2}{2} + c$

12. Integrate: $\frac{1}{x^2}$

- a) $-\frac{x^2}{2} + c$ b) $\frac{1}{x} + c$ c) $-\frac{1}{x} + c$ d) $\frac{1}{x} + c$

13. Integrate: $\frac{1}{x} - e^{2x}$

- a) $\ln x + \frac{e^{2x}}{2} + c$ b) $x^{-1} - \frac{e^{2x}}{2} + c$ c) $-\ln x - \frac{e^{2x}}{2} + c$ d) $\ln x - \frac{e^{2x}}{2} + c$

14. Evaluate $\int 2(\sin^2 x + \cos^2 x) dx$

- a) $x + c$ b) $2x + c$ c) $x^2 + c$ d) None of these

15. Evaluate $\int 1 + (\tan^2 x) dx$

- a) $\sec x + c$ b) $\sec^2 x + c$
c) $\tan x + c$ d) None of these

16. Evaluate $\int e^{3x} \sin 4x dx =$

- a) $\frac{e^{3x}}{25} [3 \sin 4x - 4 \cos 4x] + c$ b) $\frac{e^{3x}}{25} [3 \cos 4x - 4 \sin 4x] + c$
c) $\frac{e^{3x}}{5} [3 \sin 4x + 4 \cos 4x] + c$ d) $\frac{e^{3x}}{5} [3 \cos 4x - 4 \sin 4x] + c$

17. The value of $\int_1^3 3x^2 dx$ is

- a) 27 b) 26 c) 28 d) 25

18. If the matrix A is both symmetric and skew symmetric, then

- a) A is a diagonal matrix b) A is a zero matrix
c) A is a square matrix d) A is an identity matrix

19. If A is square matrix, then AA^T is

- a) symmetric b) skew symmetric
c) a scalar matrix d) a unit matrix

20. If a matrix has 6 elements, then number of possible orders of the matrix can be

- a) 2 b) 4
c) 3 d) 6

21. If A is a square matrix such that $A^2=A$, then $(I + A)^2 - 3A$ is

- a) I b) 2A
c) 3I d) A

22. The distance between the point P(1, 4) and Q(4, 0) is
a) 4 b) 5 c) 6 d) $3\sqrt{3}$
23. The midpoint of a line segment joining two points A(2, 4) and B(-2, -4) is
a) (-2, 4) b) (2, -4) c) (0, 0) d) (-2, -4)
24. A motorcycle goes 120 kilometers on 3 liters of petrol. How much petrol will be needed to go 600 kilometers?
a) 10 liter b) 12 liter c) 15 liter d) 20 liter
25. A shop has 50 televisions, out of which 5 are defective, what is the percentage of defective ones?
a) 5% b) 10% c) 15% d) 20 %
26. There are 40 children in a class, and 25% like playing football. How many children like playing football?
a) 10 b) 20 c) 30 d) 40
27. What will be the probability of getting odd numbers if a dice is thrown?
a) $1/2$ b) $1/4$ c) $1/6$ d) $1/5$
28. The probability of getting two tails when two coins are tossed is
a) $1/6$ b) $1/2$ c) $1/3$ d) $1/4$
29. What will be the probability of losing a game if the winning probability is 0.3?
a) 0.5 b) 0.6 c) 0.7 d) 0.8
30. What is the probability of drawing an ace from a pack of 52 cards?
a) $4/13$ b) $1/13$ c) $1/52$ d) None of the above
31. Which of the following probability cannot exist?
a) $2/5$ b) $-1/2$ c) $1/2$ d) None of the above
32. What will be the probability of an impossible event?
a) 0 b) 1 c) Infinity d) None of the above
33. Which of the following holds true for a vector quantity?
a) It has only magnitude b) It has only direction
c) A vector has both direction and magnitude d) A vector can never be negative

34. If $(\vec{a} + \vec{b}) = 2i - j - k$ and $(\vec{a} - \vec{b}) = 4i - 3j - 3k$ then $\frac{|\vec{a}|}{|\vec{b}|}$ is

- a) $\sqrt{\frac{17}{3}}$ b) 2 c) $\sqrt{\frac{41}{3}}$ d) 0

35. Three containers, namely cylinder, square prism and triangular prism, are given.

Which one of the following conditions will ensure that they have identical volume?

- a) Their base areas and heights are identical b) Their base areas are identical
c) Their heights are identical d) Their base areas and heights are different

36. A cylindrical pencil sharpened at one edge is the combination of

- a) two cylinders b) a hemisphere and a cylinder
c) a cone and a cylinder d) frustum of a cone and a cylinder

37. A shuttlecock used for playing badminton has the shape of the combination of

- a) A cylinder and a sphere b) A sphere and a cone
c) A cylinder and hemisphere d) Frustum of a cone and a hemisphere

38. The normal to a curve at a given point:

- a) Is always vertical b) Has a slope equal to the curve's slope at that point
c) Is perpendicular to the tangent at that point d) Is a line passing through the origin

39. The real part of $Z=3+i5$ is

- a) 3 b) -3 c) 5 d) None of these

40. If $x \tan 45^\circ \sin 30^\circ = \cos 30^\circ \tan 30^\circ$, then x is equal to

- a) $\sqrt{3}$
b) 3
c) $\sqrt{2}$
d) 1

SECTION-B LOGICAL REASONING

41. Which number is missing in the sequence? 2, 5, 8, __, 14, 17

- a) 10 b) 11 c) 12 d) 13

42. If all cats have fur, and Fluffy is a cat, what can you conclude?

- a) Fluffy has fur b) Fluffy does not have fur. c) Fluffy is a dog. d) Fluffy is a bird.

43. Which shape does not belong in the following set? Square, Triangle, Circle, Rectangle

- a) Square b) Triangle c) Circle d) Rectangle

44. If $A = 1, B = 2, C = 3, D = 4$, what is the value of $E + F + G + H$?
a) 28 b) 30 c) 32 d) 34
45. If all dogs have four legs, and Fido is a dog, what can you conclude?
a) Fido has four legs. b) Fido does not have four legs. c) Fido is a cat. d) Fido is a bird.
46. What number comes next in the sequence? 3, 6, 9, 12, __
a) 14 b) 15 c) 16 d) 18
47. Which day of the week comes two days before Saturday?
a) Sunday b) Tuesday c) Wednesday d) Friday
48. Which number comes next in the sequence? 2, 5, 9, 14, 20
a) 25 b) 26 c) 27 d) 28
49. If all squares are rectangles, and all rectangles are polygons, which of the following statements is true?
a) All squares are polygons. b) All polygons are squares.
c) All rectangles are squares. d) All squares are rectangles.
50. Which of the following is not a prime number?
a) 2 b) 3 c) 4 d) 5
51. Which of the following is a type of quadrilateral?
a) Triangle b) Square c) Circle d) Hexagon
52. If all mammals have lungs, which of the following animals is a mammal?
a) Crocodile b) Fish c) Dolphin d) Turtle
53. What is the missing number in the series? 3, 8, 15, ?, 33, 48
a) 22 b) 23 c) 24 d) 25
54. If all right angles are equal, which of the following angles is a right angle?
a) 60 degrees b) 90 degrees c) 120 degrees d) 180 degrees
55. If all rectangles have four sides and a square is a rectangle, what can you conclude
a) Squares do not have four sides. b) Squares have four sides.
c) Squares are not rectangles. d) Squares are circles
56. Which of the following is an example of inductive reasoning?
a) All prime numbers are odd.
b) Every time I eat peanuts, I get a rash.
c) The sum of the angles in a triangle is always 180 degrees.
d) If it is raining, then the ground is wet.
57. What is the next letter in the sequence? A, C, F, J?
a) L b) M c) N d) P
58. If $3x + 7 = 22$, what is the value of x ?
a) 5 b) 7 c) 8 d) 9

59. Which of the following is an example of deductive reasoning?
- a) If it is hot outside, then I will wear shorts.
 - b) All squares have four sides, but not all four-sided figures are squares.
 - c) Every time I eat ice cream, it melts.
 - d) The sum of two odd numbers is always even.
60. Which number does not belong to the following sequence? 10, 17, 26, 37, 50
- a) 1
 - b) 17
 - c) 26
 - d) 37
61. What is the missing number in the series? 2, 4, 8, 16, ?, 64
- a) 24
 - b) 28
 - c) 32
 - d) 48
62. If all squares have four equal sides and a rectangle is a quadrilateral, what can you conclude?
- a) Rectangles have four equal sides.
 - b) Rectangles do not have four equal sides.
 - c) Rectangles are not quadrilaterals.
 - d) Rectangles are circles.
63. Which of the following is an example of inductive reasoning?
- a) All living things require water to survive.
 - b) Every time I drink milk, I feel thirsty.
 - c) The first three terms of this sequence are prime numbers, so all the terms must be prime numbers.
 - d) If it is snowing, then the temperature is below freezing.
64. What is the next letter in the sequence? A, D, H, M, ?
- a) R
 - b) S
 - c) T
 - d) U
65. What is the next number in the sequence? 2, 4, 8, 16, ?
- a) 24
 - b) 32
 - c) 64
 - d) 128
66. If "ROSE" is coded as "ESOR," how would you code "TABLE"?
- a) ELBAT
 - b) ELTAB
 - c) BATLE
 - d) ETABL
67. A car traveled at an average speed of 60 km/h for the first half of the distance and 80 km/h for the second half. What was the car's average speed for the entire journey?
- a) 70 km/h
 - b) 72 km/h
 - c) 75 km/h
 - d) 76 km/h
68. If "CAT" is coded as "FEX," how would you code "DOG"?
- a) JRI
 - b) JRI
 - c) GRI
 - d) DRI
69. Which of the following is an example of deductive reasoning?
- a) All dogs have four legs, and Fido is a dog, so Fido has four legs.
 - b) All birds can fly, and penguins are birds, so penguins can fly.
 - c) Every time it rains, the ground gets wet, so it must be raining now.
 - d) The sum of two even numbers is always even.
70. If $2x - 5 = 7$, what is the value of x ?
- a) 6
 - b) 8
 - c) 10
 - d) 12
71. If "Pencil" is coded as "Aopnbf," how would you code "Paper"?
- a) Tbsfq
 - b) Tfqbs
 - c) Tfbqs
 - d) Tbfqs

72. If all cats have fur and Fluffy is a cat, what can you conclude?
- a) Fluffy has fur.
 - b) Fluffy does not have fur.
 - c) Fluffy is a dog.
 - d) Fluffy is an alien.
73. Identify the missing number in the sequence: 2, 5, 11, 20, ?
- a) 26
 - b) 29
 - c) 30
 - d) 32
74. All birds can fly. Which of the following conclusions can be logically inferred from the statement?
- a) Penguins are birds.
 - b) Ostriches cannot fly.
 - c) Bats are birds.
 - d) All birds have feathers.
75. All cats are mammals. Which of the following conclusions can be logically inferred from the statement?
- a) All mammals are cats.
 - b) Dogs are mammals.
 - c) All cats are dogs.
 - d) All mammals are animals.
76. If it is Monday, then John goes to work. Which of the following conclusions can be logically inferred from the statement?
- a) John goes to work every day.
 - b) It is Monday today.
 - c) John never goes to work.
 - d) John only goes to work on Monday.
77. If all Zargons are Widgets, and some Widgets are Doodads, which of the following statements must be true?
- a) All Zargons are Doodads.
 - b) Some Zargons are Doodads.
 - c) No Zargons are Doodads.
 - d) Some Zargons are not Doodads.
78. If a car travels 200 kilometers in 4 hours, what is its average speed in kilometers per hour?
- a) 50
 - b) 100
 - c) 150
 - d) 800
79. If all cats have tails, and Mittens is a cat, which of the following statements must be true?
- a) Mittens has a tail.
 - b) Mittens is a dog.
 - c) Mittens is a bird.
 - d) Mittens is a fish.
80. All athletes are disciplined individuals. John is an athlete. Which of the following conclusions can be drawn?
- a) John is disciplined.
 - b) All disciplined individuals are athletes.
 - b) John is not disciplined.
 - d) John is a runner.

SECTION-C ENGLISH

Read the following passage and answer the questions below

1) Radium is a white powder that has the appearance of table salt. A pound of it is worth a thousand pounds of gold. Radium is very expensive because it is very scarce. A pinch of it is worth a small fortune. There are only a few spoons in the world. But radium is so potent that excess amounts are dangerous. A pound or two gathered in one spot will kill anyone who approaches. With radium, scientists hope to learn how to change one element into another. Changing other metals into gold will be attractive and profitable. But it would be more valuable to learn how to get all the energy from atoms to do human work.

Questions:

81. What is radium?

- a) A type of metal
- b) A white powder that resembles table salt
- c) A rare mineral
- d) A valuable gemstone

82. How much is a pound of radium worth?

- a) A few dollars
- b) A few thousand dollars
- b) A thousand pounds of gold
- d) The value of a small fortune

83. What is the significance of radium?

- a) It is used to make gold
- b) It has the potential to change elements into another
- c) It has a high market value
- d) It is a valuable source of energy

84. Can radium be dangerous if in excess amounts?

- a) No, it is safe in any amount
- b) It depends on how it is used
- c) Yes, it can be deadly
- d) It is only dangerous to certain individuals

II) The Suez Canal is a man-made canal located in Egypt that connects the Red Sea to the Mediterranean Sea. It was built in the mid-19th century to provide a shorter and more direct route for ships travelling between Europe and Asia. The Suez Canal is an important waterway for international trade, with over 50,000 ships passing through each year. It is also a major source of revenue for Egypt, as ships must pay a fee to use the canal. The Suez Canal is an engineering marvel and is considered one of the greatest achievements of the 19th century.

Questions:

85. Where is the Suez Canal located?

- a) Egypt
- b) Mediterranean Sea
- c) Red Sea
- d) Europe

86. What does the Suez Canal connect?

- a) The Red Sea to the Mediterranean Sea
- b) The Mediterranean Sea to the Atlantic Ocean
- c) The Red Sea to the Indian Ocean
- d) The Mediterranean Sea to the Pacific Ocean

87. Why was the Suez Canal built?

- a) To provide a shorter and more direct route for ships
- b) To connect the two seas for recreational purposes
- c) To create a new source of revenue
- d) To boost tourism in the area

88. How many ships pass through the Suez Canal each year?

- a) 50,000
- b) 100,000
- c) 25,000
- d) 75,000

III. Conflict had existed between Spain and England since the 1570's. England wanted a share of the wealth that Spain had been taking from the lands it had claimed in the Americas. Elizabeth I, Queen of England, encouraged her staunch admiral of the navy, Sir Francis Drake, to raid Spanish ships and towns. Though these raids were on a small scale, Drake achieved dramatic success, adding gold and silver to England's treasury and diminishing Spain's supremacy.

Religious differences also caused conflict between the two countries. Whereas Spain was Roman Catholic, most of England had become Protestant. King Philip II of Spain wanted to claim the throne and make England a Catholic country again. To satisfy his ambition and also to retaliate against England's theft of his gold and silver, King Philip began to build his fleet of warships, the Spanish Armada, in January 1586.

Philip intended his fleet to be indestructible. In addition to building new warships, he marshaled 130 sailing vessels of all types and recruited more than 19,000 robust soldiers and 8,000 sailors. Although some of his ships lacked guns and others lacked ammunition, Philip was convinced that his Armada could withstand any battle with England.

The martial Armada set sail from Lisbon, Portugal, on May 9, 1588, but bad weather forced it back to port. The voyage resumed on July 22 after the weather became more stable. The Spanish fleet met the smaller, faster, and more maneuverable English ships in battle off the coast of Plymouth, England, first on July 31 and again on August 2. The two battles left Spain vulnerable, having lost several ships and with its ammunition depleted. On August 7, while the Armada lay at anchor on the French side of the Strait of Dover, England sent eight burning ships into the midst of the Spanish fleet to set it on fire. Blocked on one side, the Spanish ships could only drift away, their crews in panic and disorder. Before the Armada could regroup, the English attacked again on August 8.

Although the Spaniards made a valiant effort to fight back, the fleet suffered extensive damage. During the eight hours of battle, the Armada drifted perilously close to the rocky coastline. At the moment when it seemed that the Spanish ships would be driven onto the English shore, the wind shifted, and the Armada drifted out into the North Sea. The Spaniards recognized the superiority of the English fleet and returned home, defeated.

- a) unlimited power
- b) unrestricted growth
- c) territory
- d) treaties

90. King Philip recruited many _____ soldiers and sailors.

- a) warlike
- b) strong
- c) accomplished
- d) timid

91. The _____ Armada set sail on May 9, 1588.

- a) complete
- b) warlike
- c) independent
- d) isolated

92. The two battles left the Spanish fleet _____.

- a) open to change
- b) triumphant
- c) open to attack
- d) defeated

93. The Armada was _____ on one side.

- a) closed off
- b) damaged
- c) alone
- d) circled

IV) Fast-food is such a pervasive part of American life that it has become synonymous with American culture. Fast-food was born in America and it has now swollen into a \$106-billion industry. America exports fast-food worldwide and its attendant corporate culture, has probably been more influential and done more to destroy local food economies and cultural diversity than any government propaganda programme could hope to accomplish. No corner of the earth is safe from its presence and no aspect of life is unaffected. Fastfood is now found in shopping malls, airports, hospitals, gas stations, stadiums, on trains, and increasingly, in schools. There are 23,000 restaurants in one chain alone, and another 2,000 are being opened every year. Its effect has been the same on the millions of people it feeds daily and on the people it employs. Fast-food culture has changed how we work, from its

assembly-line kitchens filled with robotic frying machines to the trite phrases spoken to customers by its poorly paid part-time workforce. In the United States, more than 57 per cent of the population eat meals away from home on any given day and they spend more money on fast-food than they do on higher education, personal computers, or even on new cars.

Questions:

94. One point that receives a lot of attention in the passage is _____.
- a) the fact that fast-food is now more popular outside the US than it is inside
 - b) the fact that fast-food meets our dietary needs
 - c) the consideration the fast-food companies show to their employees
 - d) the far-reaching effects of the fast-food industry
95. This passage on American's fast-food industry _____.
- a) reveals the support it received from government propaganda
 - b) concentrates on negative aspects of the sector
 - c) is clearly written by someone who loves good food
 - d) shows convincingly that it is falling into disfavour
96. The assertion at the end of the passage that Americans spend more money on fastfood than they do on higher education _____.
- a) suggests that Americans are greedy for good food
 - b) is, in the light of the rest of the passage, a gross exaggeration
 - c) is a criticism of the amount of money spent on fast-food by Americans
 - d) is an indication that higher education in the US is not expensive
97. The word "swollen" in line 2 _____.
- a) draws attention to the inevitability of the growth of the industry
 - b) emphasizes the speed at which the industry has grown
 - c) implies that the industry will continue to grow on steadily
 - d) suggests that the growth is excessive and unhealthy
98. The writer of the passage clearly regrets the fact that _____.
- a) the growth of the fast-food industry has now come to a halt
 - b) the fast-food industry cannot retain the high standards with which it started
 - c) local and traditional styles of food are being pushed off the market
 - d) there are still more traditional restaurants than fast-food ones

V) In some countries the government controls all trade and in others it allows companies and firms to trade freely. However, all governments control trade in some way. Sometimes a government forbids companies to buy or sell dangerous or illegal products, or military technology. When companies expand and get bigger they often take over others and form a monopoly. Governments pass laws to prevent companies from becoming too strong and powerful and from controlling the market. Many governments try to help their own industries by making it more difficult to import foreign products. They put import taxes on foreign goods to make products more expensive and their own products cheaper. A government may also limit the number of products that it will buy from another nation. European countries, for example, may limit the number of cars that are imported from Japan or the USA. They want their people to buy European cars. We call this strategy protectionism because governments want to protect their companies and industries.

Questions:

99. Governments try to protect and develop their own industry by

- a) forbidding illegal products in certain regions
- b) putting taxes on export goods
- c) limiting the number and volume of import goods
- d) signing trade agreements with EU for cheaper goods

100. Which of the following is true?

- a) In Japan, companies are allowed to sell military technology.
- b) Medicine is freely traded all over the globe without restrictions.
- c) Governments sometimes adopt new legislation to protect companies and trade.
- d) All governments are not willing to keep trade under control.