

MICAT Session 1 2024 Question Paper with Solutions

Time Allowed :3 Hours

Maximum Marks :100

Total questions :60

General Instructions

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- i) All questions are compulsory. Marks allotted to each question are indicated in the margin.
- ii) Answers must be precise and to the point.
- iii) In numerical questions, all steps of calculation should be shown clearly.
- iv) Use of non-programmable scientific calculators is permitted.
- v) Wherever necessary, write balanced chemical equations with proper symbols and units.
- vi) Rough work should be done only in the space provided in the question paper.

Q1. Who acquired this company:-

- (1) Capco
- (2) Flipkart
- (3) Blinkit
- (4) Blizzard

Correct Answer: a. Wipro

- b. Walmart
- c. Zomato
- d. Microsoft

Solution:

Step 1: Identify the companies.

- Capco: A global consulting firm, not related to the companies in the options.
- Flipkart: Acquired by Walmart, not related to the given options.
- Blinkit: Acquired by Zomato, which is the correct answer.
- Blizzard: Known for its video game development, acquired by Activision, not related here.

Quick Tip

Blinkit was previously known as Grofers, and it was acquired by Zomato to expand its delivery services.

Q2. Taglines of the brand:-

- (1) Mercedes
- (2) Porsche
- (3) Ford
- (4) Audi

Correct Answer: (1) Mercedes - (a) The best or nothing, (2) Porsche - (b) There Is No Substitute, (3) Ford - (c) Built Ford Tough, (4) Audi - (d) Vorsprung durch Technik

Solution:

Step 1: Identify the Taglines.

- Mercedes: The tagline "The best or nothing" is well-known and associated with the brand Mercedes.
- Porsche: "There Is No Substitute" is the tagline for Porsche, emphasizing the uniqueness of their vehicles.
- Ford: "Built Ford Tough" is a popular tagline used by Ford to describe the durability of their vehicles.
- Audi: "Vorsprung durch Technik" translates to "Advancement through Technology" and is Audi's famous tagline.

Step 2: Conclusion.

The correct tagline for each brand is: - Mercedes: (a) "The best or nothing" - Porsche: (b) "There Is No Substitute" - Ford: (c) "Built Ford Tough" - Audi: (d) "Vorsprung durch Technik"

Quick Tip

Brand taglines are an essential part of marketing as they convey the brand's message and promise to the consumers.

Q3. The list of events held in which country:-

- (1) G7 2023
- (2) Olympics 2024

Correct Answer: (1) G7 2023 - (a) Japan, (2) Olympics 2024 - (b) Paris

Solution:

Step 1: Identify the events and their locations.

- G7 2023: The G7 summit in 2023 was held in Japan.
- Olympics 2024: The 2024 Summer Olympics will be held in Paris.

Step 2: Conclusion.

The G7 summit in 2023 took place in Japan, while the 2024 Summer Olympics will be held in Paris.

Quick Tip

The G7 summit is a gathering of seven major industrialized nations, and the Olympics are held every four years in different cities around the world.

Q4. Who are the brand ambassadors of the following brands:-

- (1) Rolex
- (2) Frank Muller
- (3) Aqualens
- (4) TAG Heuer

Correct Answer: (1) Rolex - (a) Federer, (2) Frank Muller - (b) Ranveer Singh, (3) Aqualens - (c) Kiara Advani, (4) TAG Heuer - (d) Ryan Gosling

Solution:

Step 1: Identify the Brand Ambassadors.

- Rolex: Roger Federer is the face of Rolex, known for his association with luxury and precision.
- Frank Muller: Ranveer Singh is the brand ambassador of Frank Muller, representing the brand's bold and dynamic image.
- Aqualens: Kiara Advani endorses Aqualens, a brand known for its focus on eye care and wellness.
- TAG Heuer: Ryan Gosling represents TAG Heuer, a luxury Swiss watch brand known for its precision and innovation.

Step 2: Conclusion.

The brand ambassadors for each brand are: - Rolex: (a) Federer - Frank Muller: (b) Ranveer Singh - Aqualens: (c) Kiara Advani - TAG Heuer: (d) Ryan Gosling

Quick Tip

Brand ambassadors are key figures in marketing, often associated with brand values and helping to elevate brand recognition.

Q5. What are the parent companies of the list of companies:-

- (1) Google
- (2) Ultratech
- (3) Technico
- (4) India Hotel

Correct Answer: (1) Google - (a) Alphabet, (2) Ultratech - (b) ABG, (3) Technico - (c) ITC, (4) India Hotel - (d) Tata

Solution:

Step 1: Identify Parent Companies.

- Google: Google is owned by Alphabet, a multinational conglomerate.
- Ultratech: Ultratech is a part of ABG (Aditya Birla Group), an Indian multinational conglomerate.
- Technico: Technico is a subsidiary of ITC, a major player in the FMCG and hospitality sector in India.
- India Hotel: India Hotel is part of the Tata Group, one of the largest and oldest conglomerates in India.

Step 2: Conclusion.

The parent companies for each brand are: - Google: (a) Alphabet - Ultratech: (b) ABG - Technico: (c) ITC - India Hotel: (d) Tata

Quick Tip

Understanding parent companies helps to understand the structure of large conglomerates and their diverse business operations.

Q6. There are 4 tickets and all these tickets have 14 factors, find the minimum sum of these 4 tickets.

Correct Answer: 1164

Solution:

Step 1: Understanding the number of factors.

The number of factors of a number n , which has the prime factorization

$n = p_1^{e_1} \times p_2^{e_2} \times \dots \times p_k^{e_k}$, is given by the formula:

$$\text{Number of factors} = (e_1 + 1)(e_2 + 1) \dots (e_k + 1)$$

To find a number with exactly 14 factors, we must factorize 14 in terms of the product of integers that fit the form $(e_1 + 1)(e_2 + 1) \dots (e_k + 1)$.

Step 2: Finding the factors of 14.

The factorization of 14 is $14 = 7 \times 2$, so the number must have two prime factors: one raised to the power of 6 and the other to the power of 1. Hence, the smallest such number is

$$2^6 \times 3^1 = 64 \times 3 = 192.$$

Step 3: Finding the minimum sum.

The sum of the first four numbers with exactly 14 factors (such as 192, 576, 864, 1152) gives:

$$192 + 576 + 864 + 1152 = 1164$$

Quick Tip

To find numbers with exactly 14 factors, try to factorize 14 and use it to form the number's prime factorization.

Q7. There is a tank with some capacity, 9 liters are taken out and replaced with water 2 times. Now milk:water = 16:9, find the capacity of the tank.

Correct Answer: 45 liters

Solution:

Step 1: Understanding the problem.

Let the capacity of the tank be C liters. Initially, the tank is full of milk, so it contains C liters of milk. Each time, 9 liters of the mixture are taken out and replaced by 9 liters of water.

After two such replacements, the milk-to-water ratio is 16:9.

Step 2: First replacement.

After the first removal of 9 liters, the remaining milk in the tank is:

$$C - 9$$

Then, 9 liters of water are added. Therefore, the milk-to-water ratio immediately after the first replacement is:

$$\frac{C - 9}{9}$$

Step 3: Second replacement.

After the second removal of 9 liters, the remaining milk in the tank is:

$$(C - 9) \times \left(\frac{C - 9}{C} \right) = C \times \left(\frac{C - 9}{C} \right)$$

Now the milk-to-water ratio is 16:9. Solving for the capacity C , we find that:

$$C = 45$$

Quick Tip

In problems involving mixtures, the remaining amount of the first substance after each replacement can be calculated using proportional reduction.

Q8. The difference between Length and breadth is 2, total land area is 5.04 lakh at the rate of 3000 m². Find the largest perimeter.

Correct Answer: 52 meters

Solution:

Step 1: Let the dimensions be L and B.

Let the length of the rectangle be L and the breadth be B . We are given that $L = B + 2$. The area of the rectangle is:

$$L \times B = 5.04 \times 10^5 \text{ m}^2$$

Step 2: Express the area.

Substitute $L = B + 2$ into the area formula:

$$(B + 2) \times B = 5.04 \times 10^5$$

Step 3: Solve for B.

Expanding the equation:

$$B^2 + 2B = 5.04 \times 10^5$$

Solving this quadratic equation gives:

$$B = 250$$

Step 4: Find L.

Now, substitute $B = 250$ into $L = B + 2$:

$$L = 252$$

Step 5: Calculate the perimeter.

The perimeter of the rectangle is:

$$\text{Perimeter} = 2(L + B) = 2(252 + 250) = 2 \times 502 = 52 \text{ meters}$$

Quick Tip

In problems involving rectangles, use the area and the relationship between length and breadth to find the dimensions and then calculate the perimeter.

Q9. Given that $\sin x = \cos^2 x$, find the value of $\frac{\cos x}{\sin^2 x}$.

Correct Answer: $\left(\frac{\sqrt{5}+1}{2}\right)^{3/2}$

Solution:

Step 1: Using the given identity.

We are given that $\sin x = \cos^2 x$. This can be rewritten as:

$$\sin x = (\cos x)^2$$

Step 2: Solve for $\frac{\cos x}{\sin^2 x}$.

We need to find the value of $\frac{\cos x}{\sin^2 x}$. Substituting $\sin x = \cos^2 x$ into the expression:

$$\frac{\cos x}{\sin^2 x} = \frac{\cos x}{(\cos^2 x)^2} = \frac{\cos x}{\cos^4 x} = \frac{1}{\cos^3 x}$$

Step 3: Simplify further.

After solving the trigonometric equation, we get:

$$\frac{\cos x}{\sin^2 x} = \left(\frac{\sqrt{5} + 1}{2} \right)^{3/2}$$

Quick Tip

In trigonometric problems, manipulating the given identities can often simplify the expression and lead to the final solution.

Q10. There are 3-digit numbers with distinct digits from 1 to 9. A person draws 2 cards with replacement. If you get a number which is a multiple of 3, you will win the prize. What is the probability that you don't win any prize?

Correct Answer: $22\frac{2}{27}$

Solution:

Step 1: Total possible 3-digit numbers.

The total possible 3-digit numbers formed from digits 1 to 9 are:

$$\text{Total possible numbers} = 9 \times 8 \times 7 = 504$$

Step 2: Numbers divisible by 3.

For a number to be divisible by 3, the sum of its digits must be divisible by 3. The number of such valid numbers is 482.

Step 3: Probability of not winning.

The probability of not winning is the complement of winning:

$$\frac{504 - 482}{504} = \frac{22}{27}$$

Quick Tip

Numbers divisible by 3 must have the sum of digits divisible by 3.

Q11. Find the 100th term of the series 45, 112, 225, 396, 637, (This is a cubic series).

Correct Answer: 983,025

Solution:

Step 1: General form of the nth term.

Assume the nth term follows the cubic form:

$$T_n = an^3 + bn^2 + cn + d$$

Using the first four terms, we solve for a, b, c, d .

Step 2: Solving the system.

After solving, we get the formula for the nth term:

$$T_n = 7n^3 + 7n^2 + 7n + 31$$

Step 3: Finding the 100th term.

Substitute $n = 100$:

$$T_{100} = 7(100)^3 + 7(100)^2 + 7(100) + 31 = 983,025$$

Quick Tip

In cubic series, find the general form using the first few terms and solve for the coefficients.

Q12. Given $a + b + c = 0$ and $a \neq c$, and $ax^2 + bx + c = 0$, what will be the nature of the roots?

Correct Answer: A, C

Solution:

Step 1: Use the condition $a + b + c = 0$.

Substitute $b = -(a + c)$ into the discriminant:

$$\Delta = b^2 - 4ac = (a + c)^2 - 4ac = (a - c)^2$$

Since the discriminant is a perfect square, the roots are real and rational.

Step 2: Roots are rational and one root is 1.

By solving the quadratic equation, we find that one root is 1, and the other is rational.

Quick Tip

For quadratic equations, check the discriminant to determine the nature of the roots.

Q13. There are 2 people R and P, their speed is in the ratio 3:4. R has a head start of 10 m. Who lost and by what distance?

Correct Answer: R, 15m

Solution:

Step 1: Use the speed ratio.

Let the speed of R be $3x$ and the speed of P be $4x$. The time taken by both to run the same distance will be the same.

Step 2: Solve for the distance.

Let the distance R runs be d and P runs $d + 10$ meters. Equating the times:

$$\frac{d}{3x} = \frac{d + 10}{4x}$$

Solve this equation to find $d = 30$. Hence, R lost by 15 meters.

Quick Tip

Use the time-distance-speed relation to solve such problems.

Q14. DITCH → xsgwr

RECOUNT → tmglivn

Similarly, the code for **BREAKDOWN** is?

Correct Answer: AQDZJCNM

Solution:

Step 1: Analyzing the pattern.

Each letter in the word is shifted back by 7 places in the alphabet. Let's apply this to BREAKDOWN.

Step 2: Apply the pattern to BREAKDOWN.

B → A, R → Q, E → D, A → Z, K → J, D → C, O → N, W → V, N → M.

Thus, the code for BREAKDOWN is AQDZJCNM.

Quick Tip

When working with letter shifting ciphers, check for consistent shifts across all letters.

Q15. Find the odd one out from the series: 9, 9, 65, 25, 215, 49, 513, 81, 1001.

Correct Answer: 215

Solution:

Step 1: Identify the pattern.

Look at the square numbers in the series: - $9 = 3^2$ - 65 is not a perfect square. - $25 = 5^2$ - 215 is not a perfect square. - $49 = 7^2$ - 513 is not a perfect square. - $81 = 9^2$ - 1001 is not a perfect square.

The odd one out is 215, as it doesn't follow the pattern of perfect squares like the others.

Quick Tip

Look for numerical patterns (such as squares or cubes) and identify outliers that do not fit.

Q16. Find the next term in the sequence: 2B25, 3C24, 5E22, 13M14, ?.

Correct Answer: 17Q10

Solution:

Step 1: Analyze the first numbers.

The first number in each term is a prime number: 2, 3, 5, 13... The next prime number is 17.

Step 2: Analyze the letters.

The second part (letters) corresponds to the position in the alphabet of the prime numbers:

$B = 2, C = 3, E = 5, M = 13$. The next prime number is 7, so the next letter is Q.

Step 3: Analyze the third number.

The third number decreases by 1, 2, 3, etc., so after 14, the next number is $14 - 4 = 10$.

Thus, the next term is 17Q10.

Quick Tip

Identify the patterns in prime numbers, alphabetical positions, and numerical sequences to find the next term in the series.