PATTERNS

PATTERNS

TEACHING TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Questions

1. a) 1
Explanation: The pattern decreases by 2 each time (9, 7, 5, 3...), so the next number is 1.

2. b) Square, Circle, Triangle
Explanation: The sequence repeats the core pattern "Square, Circle, Triangle."

3. a) 60
Explanation: The pattern decreases by 10 each time (100, 90, 80, 70...), so the next number is 60.

4. c) A, B, C
Explanation: The core pattern in the sequence "ABC, ABC, ABC..." is "A, B, C."

5. b) 32
Explanation: The pattern increases by consecutive even numbers (2, 6, 12, 20...), so the next number is 32.

6. c) Hexagon, Pentagon
Explanation: The core pattern alternates between Hexagon and Pentagon.

ADVANCED LEVEL

More than One Answer Type

7. D) 20, 5
Explanation: The pattern repeats every four numbers (5, 10, 15, 20), so the next two numbers are 20 and 5.

Fill In the Blanks

8. Core Pattern: 2, 4, 6. The next number in the sequence is 2.
Explanation: The core pattern repeats every three numbers (2, 4, 6), so the next number is 2.

Matching Type

9. Match each core pattern with its extended sequence.
1. C. 5, 10, 5, 10, 5, 10, 5, 10
2. D. Circle, Square, Triangle, Circle, Square, Triangle

3. B. Green, Blue, Green, Blue, Green, Blue
4. A. A, B, C, A, B, C, A, B, C
Explanation: The core pattern is matched with its extended sequence.

Answer the Following Questions
10. 35
Explanation: The pattern increases by 7 each time (7, 14, 21, 28...), so the next number is 35.

2. 64
Explanation: The pattern doubles each time (2, 4, 8, 16, 32...), so the next number is 64.

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Questions
1. b) 20
Explanation: The sequence increases by 4 each time (4, 8, 12, 16...), so the next number is 20.

2. a) Red, Blue
Explanation: The core pattern repeats with Red and Blue in an alternating sequence.

3. a) Circle
Explanation: The sequence alternates between Circle and Triangle, so the next shape is Circle.

4. c) Add 1, then 2, then 3, etc.
Explanation: The sequence increases by adding consecutive numbers: 1, 2, 3, etc. (1, 3, 6, 10, 15...).

5. b) 32
Explanation: The pattern doubles each time (2, 4, 8, 16...), so the next number is 32.

6. b) A, B
Explanation: The core pattern repeats with A and B in alternating order.

ADVANCED LEVEL

More than One Answer Type
7. C) 7, 14, 21
Explanation: The sequence repeats every three numbers (7, 14, 21), so the next three numbers are 7, 14, and 21.

Fill In the Blanks
8. The next number in the sequence is 40.

Explanation: The rule adds 8 each time (8, 16, 24, 32...), so the next number is 40.

Matching Type
9. Match each core pattern with its extended sequence.
1. C. 7, 14
2. B. Red, Yellow
3. D. Square, Circle, Triangle
4. A. 2, 4, 8
Explanation: The patterns match with their core sequences.

Answer the Following Questions
10. The core pattern is adding 5 each time.
Explanation: The sequence increases by 5 each time (5, 10, 15, 20, 25...).

11. The 7th element is C.
Explanation: The core pattern repeats every three elements (A, B, C), so the 7th element is C.

GROWING AND SHRINKING PATTERNS

TEACHING TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Questions
1. a) 25
Explanation: The pattern is shrinking by the squares of consecutive integers ($81 = 9^2$, $64 = 8^2$, $49 = 7^2$, $36 = 6^2$), so the next number is 25 (5^2).

2. c) 80
Explanation: The sequence doubles each time (5, 10, 20, 40...), so the next number is 80.

3. a) Extra Small Triangle
Explanation: The pattern is shrinking in size (Large Triangle, Medium Triangle, Small Triangle...), so the next triangle will be "Extra Small Triangle."

4. c) 64
Explanation: The pattern doubles each time (4, 8, 16, 32...), so the next number is 64.

5. d) 18
Explanation: The pattern decreases by 3 each time (30, 27, 24, 21...), so the next number is 18.

6. b) 25
Explanation: The sequence is the squares of consecutive integers ($1 = 1^2$, $4 = 2^2$, $9 = 3^2$, $16 = 4^2$...), so the next number is 25 (5^2).

ADVANCED LEVEL

More than One Answer Type

7. A) 25
Explanation: The sequence is shrinking by squares of consecutive integers ($81 = 9^2$, $64 = 8^2$, $49 = 7^2$, $36 = 6^2$...), so the next number is 25 (5^2).

Fill In the Blanks

8. 0
Explanation: The sequence is shrinking by the squares of consecutive integers ($16 = 4^2$, $9 = 3^2$, $4 = 2^2$, $1 = 1^2$), so the next number is 0 (0^2).

Matching Type

9. Match each core pattern with the corresponding growing or shrinking sequence.
1. B. Each number increases by 1.
2. C. Each number decreases by 10.
3. A. Each number is multiplied by 3.
4. D. Each number doubles from the previous one.

Answer the Following Questions

10. The 6th term is 16.
Explanation: The sequence is shrinking by squares of consecutive integers ($81 = 9^2$, $64 = 8^2$, $49 = 7^2$, $36 = 6^2$...), so the 6th term is 16 (4^2).

11. The next term is 80.
Explanation: The sequence doubles each time (5, 10, 20, 40...), so the next term is 80.

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Questions

1. b) 15
Explanation: The sequence increases by 3 each time (3, 6, 9, 12...), so the next number is 15.

2. a) Extra Large Square
Explanation: The pattern increases in size (Small Square, Medium Square, Large Square...), so the next shape is Extra Large Square.

3. b) 81
Explanation: The sequence is multiplying by 3 each time (1, 3, 9, 27...), so the next number is 81.

4. a) 30
Explanation: The sequence decreases by 5 each time (50, 45, 40, 35...), so the next number is 30.

5. b) 32
Explanation: The sequence doubles each time (2, 4, 8, 16...), so the next number is 32.

6. a) Small Circle
Explanation: The pattern decreases in size (Extra Large Circle, Large Circle, Medium Circle...), so the next shape is "Small Circle.

ADVANCED LEVEL

More than One Answer Type
7. D) Extra Large Triangle, Extra Extra Large Triangle
Explanation: The sequence increases in size (Small Triangle, Medium Triangle, Large Triangle, Extra Large Triangle...), so the next two shapes are "Extra Large Triangle" and "Extra Extra Large Triangle."

Fill In the Blanks
8. 15
Explanation: The sequence increases by 3 each time (3, 6, 9, 12...), so the next number is 15.

Matching Type
9. Match each pattern with its description.
1. B. Each number increases by 3.
2. C. The size of the triangle decreases progressively.
3. A. Each number is the square of an integer in decreasing order (9^2, 8^2, 7^2, 6^2, 5^2, ...).
4. D. Each number doubles from the previous one.

Answer the Following Questions
10. 48
Explanation: The sequence doubles each time (3, 6, 12, 24...), so the next term is 48.

11. 60
Explanation: The sequence decreases by 10 each time (100, 90, 80, 70...), so the 4th term is 60.

PATTERNS WITH NUMBERS

TEACHING TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Questions

1. a) 243
Explanation: The geometric sequence multiplies by 3 each time (3, 9, 27, 81...), so the next number is 243.

2. c) 21
Explanation: In the Fibonacci sequence, each number is the sum of the two previous numbers (1, 1, 2, 3, 5, 8, 13...), so the next number is 21.

3. b) 100
Explanation: The sequence consists of square numbers ($4 = 2^2$, $16 = 4^2$, $36 = 6^2$, $64 = 8^2$...), so the next number is 100 (10^2).

4. a) 30
Explanation: The sequence decreases by 5 each time (50, 45, 40, 35...), so the next number is 30.

5. a) 42
Explanation: The sequence increases by consecutive numbers (2, 6, 12, 20, 30...), adding 2, 4, 6, 8, etc., so the next number is 42.

6. b) 37
Explanation: The difference between consecutive terms is increasing by 1 each time (3, 5, 7, 9...), so the next number is 37.

ADVANCED LEVEL

More than One Answer Type

7. A) 21, D
Explanation: The sequence is made up of triangular numbers, where each term is the sum of the natural numbers up to that point (1, 3, 6, 10, 15...). So, the next number is 21.

Fill In the Blanks

8. 567
Explanation: The sequence multiplies by 3 each time (7, 21, 63, 189...), so the next number is $189 \times 3 = 567$.

Matching Type

9. Match each number pattern with its description.
1. B. Each number is obtained by adding a fixed number to the previous number (add 4 each time).
2. A. Each number is obtained by multiplying the previous number by increasing

integers (1!, 2!, 3!, 4!, ...).
3. C. Each number is the sum of the two preceding numbers.
4. D. Each number is the square of an integer (3^2, 4^2, 5^2, 6^2, ...).

Answer the Following Questions
10. 324
Explanation: The geometric pattern multiplies by 3 each time (4, 12, 36, 108...), so the next number is 108 × 3 = 324.

11. 13
Explanation: In the Fibonacci sequence, the next number is the sum of the last two terms (5 + 8 = 13).

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Questions
1. b) 30
Explanation: The sequence increases by 5 each time (5, 10, 15, 20...), so the next number is 30.

2. a) 324
Explanation: The sequence is a geometric sequence where each number is multiplied by 3 (4, 12, 36, 108...), so the next number is 108 × 3 = 324.

3. b) 21
Explanation: In the Fibonacci sequence, each number is the sum of the two previous numbers (3 + 5 = 8, 5 + 8 = 13...), so the next number is 13 + 8 = 21.

4. b) 81
Explanation: The sequence consists of square numbers ($1 = 1^2$, $9 = 3^2$, $25 = 5^2$, $49 = 7^2$...), so the next number is 81 (9^2).

5. b) 35
Explanation: The sequence consists of triangular numbers (1, 3, 6, 10, 15...), and the next triangular number is 35.

6. b) 112
Explanation: The sequence doubles each time (7, 14, 28, 56...), so the next number is 56 × 2 = 112.

ADVANCED LEVEL

More than One Answer Type
7. A, C) 89

Explanation: The Fibonacci sequence continues with the sum of the two previous numbers (21 + 34 = 55, 34 + 55 = 89).

Fill In the Blanks

8. 36
Explanation: The sequence is made up of consecutive square numbers ($4 = 2^2$, $9 = 3^2$, $16 = 4^2$, $25 = 5^2$), so the next number is 36 (6^2).

Matching Type

9. Match each sequence with the rule that generates it.
1. B. Multiply the previous number by 2.
2. C. Square each integer (1^2, 2^2, 3^2, 4^2, ...).
3. A. Add successive odd numbers (1+3=4, 4+5=9, 9+7=16, ...).
4. D. Multiply the previous number by 3.

Answer the Following Questions

10. 49
Explanation: The 7th term in the sequence of square numbers (1^2, 2^2, 3^2, 4^2, 5^2, 6^2...) is 49 (7^2).

11. 21
Explanation: The next number in the triangular number sequence (1, 3, 6, 10, 15...) is 21 (sum of 1 + 2 + 3 + 4 + 5 + 6 = 21).

TILING

TEACHING TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Questions

1. b) Bathroom floor tiles
Explanation: Symmetrical tiling is commonly used for practical purposes, such as bathroom floor tiles, where symmetry and evenness are crucial for both aesthetics and functionality.

2. b) Penrose Tiling
Explanation: Penrose tiling is an example of Escher-like tiling, which creates non-repeating, non-periodic patterns.

3. c) Triangles
Explanation: Triangular tiling uses equilateral triangles to cover surfaces without gaps, which is common in certain tessellation patterns.

4. c) Hexagonal Tiling

Explanation: Hexagonal tiling is often used to create honeycomb-like structures, as hexagons fit together perfectly without gaps, much like in natural honeycombs.

5. c) Mosaic Tiling
Explanation: Mosaic tiling is often used for its aesthetic appeal in wall coverings, particularly in decorative and intricate designs.

6. d) Irregular Tiling
Explanation: Irregular tiling involves non-periodic patterns that do not follow a regular, repeating design and can be arranged without gaps or overlaps.

ADVANCED LEVEL

More than One Answer Type
7. B) Can involve non-periodic patterns, like Penrose tiling.
C) Often creates intricate designs using interlocking shapes.
D) Includes patterns where tiles fit together perfectly with no gaps or overlaps.
Explanation: Escher tiling often involves non-periodic patterns (like Penrose tiling), interlocking shapes, and designs that fit together without gaps.

Fill In the Blanks
8. Symmetrical tiling.
Explanation: A pattern where tiles are arranged symmetrically, so the design looks the same from multiple viewpoints, is called symmetrical tiling.

Matching Type
9. Match each tiling pattern with its practical application.
1. B. Commonly seen in flooring and bathroom designs, where the tiles are arranged in a grid pattern.
2. D. Utilized in creating a honeycomb-like structure, often seen in natural patterns and modern design elements.
3. A. Used for creating decorative wall coverings with intricate designs, often with varying colors and shapes.
4. C. Found in artistic patterns that cover a surface without repeating in a regular way, creating visually complex designs.
Explanation: Square tiling is commonly used for flooring, hexagonal tiling creates a honeycomb structure, mosaic tiling is used for intricate wall coverings, and Penrose tiling creates non-repeating artistic designs.

Answer the Following Questions
10. 10 hexagons
Explanation: If each hexagon covers the same area as 2 pentagons and you have 5 pentagons, you would need 5 × 2 = 10 hexagons.

11. Area of one hexagonal tile = $\frac{3\sqrt{3}}{2} \times side^2$

Using the side length of 2 cm:

Area = $\frac{3\sqrt{3}}{2} \times (2)^2 = \frac{3\sqrt{3}}{2} \times 4 = 6\sqrt{3}$

Approximate value = 10.39 cm².

LEARNERS TASK

CONCEPTUAL UNDERSTANDING QUESTIONS (CUQ's)

Multiple Choice Questions

1. c) Square
Explanation: Square tiling is the most common shape used in regular tiling that forms a grid pattern because squares fit together perfectly without gaps or overlaps.

2. c) 6
Explanation: In hexagonal tiling, each individual hexagon is surrounded by 6 other hexagons, forming a honeycomb-like pattern.

3. c) Triangular tiling with various types of triangles
Explanation: Irregular tiling involves shapes that do not follow a regular or repeating pattern, and triangular tiling with various types of triangles is an example of such a pattern.

4. b) Irregular Tiling
Explanation: Mosaic designs are often created with irregular tiling because they use non-standard or varied shapes that create complex, artistic designs.

5. c) Square Tiling
Explanation: Square tiling is commonly used for flooring with ceramic tiles, where tiles are arranged in a grid pattern.

6. d) Pentagonal Tiling
Explanation: Pentagonal tiling does not form a regular tiling pattern because pentagons cannot tile the plane without gaps or overlaps in a regular pattern.

ADVANCED LEVEL

More than One Answer Type

7. A) A pattern of hexagons arranged in a honeycomb structure.
B) A floor design using squares arranged in a checkerboard pattern.
D) A mosaic pattern with rotational symmetry using colored tiles.
Explanation: Symmetrical tiling patterns include hexagonal honeycomb structures, checkerboard designs with squares, and mosaic patterns with rotational symmetry. Non-repeating designs (like C) are not considered symmetrical tiling.

Fill In the Blanks

8. The tile shape in this pattern is hexagonal.
Explanation: If the tiling pattern is described as a honeycomb structure, it uses hexagonal tiles.

Matching Type

9. Match each type of tiling with its description.
1. B. Uses standard geometric shapes like squares or hexagons that fit together without gaps or overlaps.
2. D. Uses irregular or non-standard shapes, resulting in more complex patterns that may not fit together in a simple way.
3. C. Arranges tiles in a way that exhibits a pattern with symmetry, such as rotational or reflectional symmetry.
4. A. Uses shapes that fit together perfectly in a repeating pattern to cover a plane with no gaps, often with complex designs.
Explanation: Regular tiling uses standard shapes (like squares or hexagons), irregular tiling uses non-standard shapes, symmetrical tiling includes patterns with symmetry, and Escher tiling involves complex repeating patterns.

Answer the Following Questions

10. 9 tiles
Explanation: If the pattern is a 3x3 grid, there are 9 tiles in total. If each tile is arranged with rotational symmetry of 90 degrees, all the tiles would still be required to form the complete pattern.

11. 6 square tiles
Explanation: If there are 12 tiles in total and half are square tiles, $12 \div 2 = 6$ square tiles would be used.