# CLASS VIII – MATHEMATICS

## Chapter Test: Exploring Some Geometric Themes – Step-by-Step Solutions & Marking Scheme

(Ganita Prakash, Grade 8, Part II – Chapter 4)

M. M.: 40 | Marks for each step are shown in square brackets.

### Section A – Multiple Choice Questions (1 mark each)

| Q. | Ans. | Solution |
|---|---|---|
| **1** | **(B)** | $R_n = 8^n$; $R_2 = 8^2 = \mathbf{64}$. |
| **2** | **(D)** | Each triangle gives 3 triangles: $3^3 = \mathbf{27}$. |
| **3** | **(A)** | A prism with n-sided bases has 3n edges (n at the top, n at the bottom, n joining them): $3 \times 5 = \mathbf{15}$. |
| **4** | **(C)** | A square pyramid has 4 edges in the base and 4 edges joining the apex to the base: **8**. |
| **5** | **(B)** | The equilateral triangle has 3 sides and each side is replaced by 4 smaller sides: $3 \times 4 = \mathbf{12}$. |
| **6** | **(D)** | When a cone is slit open and unrolled, the curved surface becomes a **sector of a circle** (the base is a circle). |
| **7** | **(A)** | From the rectangle AECD in Fig. 4.3, p = AE ≤ AB = l, with equality when the line is parallel to the plane. So the projection is **at most equal to** the actual length. |
| **8** | **(C)** | A cube has **11** different nets. |
| **9** | **(B)** | The square of side 9 cm has area 81 cm². At Step 1 the central 1/9 is removed (9 cm²). Remaining area = 81 − 9 = **72 cm²** (8/9 of 81). |
| **10** | **(C)** | Total cubes = 3 + 1 + 2 + 1 = **7**. |

### Section B – Very Short Answer Questions (2 marks each)

**Q11. Net (Fig. 3)**

(i) A square base with four triangles on its sides folds into a **square pyramid**. [1]

(ii) Faces = 1 + 4 = **5**; edges = 4 + 4 = **8**; vertices = 4 + 1 = **5**. [1]

**Q12.**

(A) $H_{n+1} = H_n + R_n$, with $H_0 = 0$ and $R_n = 3^n$. [1]

$H_1 = 1$, $H_2 = 1 + 3 = 4$, $H_3 = 4 + 9 = \mathbf{13}$. [1]

(B) A hexagonal prism has 2 hexagonal bases and 6 rectangular faces: faces = **8**. [1]

Edges = $3 \times 6 = \mathbf{18}$; vertices = $2 \times 6 = \mathbf{12}$. [1]

**Q13.**

Step 0: 3 sides of length 1, perimeter 3. Step 1: 12 sides of length 1/3, perimeter $12 \times 1/3 = 4$. [1]

Step 2: 48 sides of length 1/9, perimeter = 48/9 = **16/3 units**. [1]

### Section C – Short Answer Questions (3 marks each)

**Q14. Shortest path (Fig. 4)**

(i) Unfolding 1: $AL^2 = 15^2 + 8^2 = 225 + 64 = 289$, so AL = **17 cm**. [1]

(ii) Unfolding 2: $AL^2 = 12^2 + 16^2 = 144 + 256 = 400$, so AL = **20 cm**. [1]

(iii) Unfolding 1 gives the shorter path (17 cm), which is 20 − 17 = **3 cm** shorter. [1]

**Q15.**

(A) Every remaining square gives 8 squares: $R_{n+1} = 8R_n$, $R_0 = 1$, so $\mathbf{R_n = 8^n}$. [1]

$R_3 = 8^3 = \mathbf{512}$. [1]

$H_3 = 1 + 8 + 8^2 = 1 + 8 + 64 = \mathbf{73}$. [1]

(B) Triangles at Step 4 = $3^4 = \mathbf{81}$. [1]

Each step keeps 3/4 of the area. Area at Step 4 = $(3/4)^4$ [1] = 81/256 sq. unit. [1]

**Q16.**

(A) (i) Number of sides = $3 \times 4^3 = 3 \times 64 = \mathbf{192}$. [1]

(ii) Each side = $(1/3)^3 = \mathbf{1/27\ unit}$. [1]

(iii) Perimeter = $192 \times 1/27 = 192/27 = \mathbf{64/9\ units}$. [1]

(B) Cutting along the height gives a rectangle with one side = height = **10 cm**. [1]

The other side = circumference of the base = $2\pi r = 2 \times (22/7) \times 7 = \mathbf{44\ cm}$. [1]

Area = $44 \times 10 = \mathbf{440\ cm^2}$. [1]

**Q17.**

(A) Front view: an L-shape — a row of 3 squares with 1 square above the leftmost one. [1]

Top view: a row of 3 squares (the top cube hides nothing else). [1]

Side view (from the right): a column of 2 squares (width 1, height 2), because the tallest part is 2 cubes high and 1 cube deep. [1]

(B) Front view: 6 cm × 3 cm (length × height) rectangle. [1]

Top view: 6 cm × 4 cm (length × width) rectangle. [1]

Side view: 4 cm × 3 cm (width × height) rectangle. [1]

## Section D – Long Answer / Case-based Questions (4 marks each)

**Q18.**

(A) (i) Triangles: Step 0 = **1**, Step 1 = **3**, Step 2 = **9**. [1]

(ii) Holes: Step 0 = **0**, Step 1 = **1**, Step 2 = 1 + 3 = **4**. [1]

(iii) Area at Step 2 = $64 \times (3/4)^2 = 64 \times 9/16 = \mathbf{36\ cm^2}$. [1]

(iv) Triangles at Step 5 = $3^5 = \mathbf{243}$. [1]

(B) (i) Faces = **6**, edges = **12**, vertices = **8**. [1]

(ii) Surface area = $2(lb + bh + lh) = 2(6\times4 + 4\times3 + 6\times3) = 2(24 + 12 + 18)$ [1] = $\mathbf{108\ cm^2}$. [1]

(iii) A cube has **11** different nets. [1]

**Q19.**

(A) (i) $d^2 = 24^2 + 10^2 = 576 + 100 = 676$, so d = **26 cm**. [1]

(ii) $d^2 = 20^2 + 21^2 = 400 + 441 = 841$, so d = **29 cm**. [1]

(iii) 26 < 29, so the **first unfolding gives the shortest path, 26 cm**. [1]

(iv) The distance between the ant and the laddu on the net depends on how the cuboid is unfolded, so each possible unfolding can give a different length; the smallest of them is the shortest path. [1]

(B) (i) Prism with 12-sided bases: faces = 12 + 2 = **14**. [1] Edges = 3 × 12 = **36**; vertices = 2 × 12 = **24**. [1]

(ii) Pyramid with 12-sided base: faces = 12 + 1 = **13**. [1] Edges = 2 × 12 = **24**; vertices = 12 + 1 = **13**. [1]

**Q20. Case Study: Tile design**

(i) Area = $27 \times 27 = \mathbf{729\ cm^2}$. [1]

(ii) At Step 2 there are $8^2 = \mathbf{64}$ squares; each has side $27 \div 9 = \mathbf{3\ cm}$ (Step 1: side 9; Step 2: side 3). [1]

(iii) Coloured area = $64 \times 3 \times 3 = \mathbf{576\ cm^2}$. [1]

(iv) Fraction = 576/729 = **64/81** (= $(8/9)^2$). [1]

**Note for teachers:** Award full marks for any correct alternative method. In Q17 accept clearly drawn sketches in place of verbal descriptions of the views. Units must be stated in the final answers.