CLASS VIII – MATHEMATICS

Chapter Test: The Baudhāyana-Pythagoras Theorem – Step-by-Step Solutions & Marking Scheme

(Ganita Prakash, Grade 8, Part II – Chapter 2)

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

Section A – Multiple Choice Questions (1 mark each)

Q.	Ans.	Solution
1	**(C)**	$c^2 = 9^2 + 12^2 = 81 + 144 = 225$, so c = **15 cm**.
2	**(B)**	A primitive triple has no common factor greater than 1. (9,12,15), (6,8,10) and (15,20,25) all have common factors (3, 2, 5). (12, 35, 37) has none, and $12^2 + 35^2 = 144 + 1225 = 1369 = 37^2$. So **(12, 35, 37)**.
3	**(A)**	$20^2 + 21^2 = 400 + 441 = 841 = 29^2$, so **(20, 21, 29)** is a triple. (The others do not satisfy $a^2 + b^2 = c^2$.)
4	**(D)**	$b^2 = 26^2 - 10^2 = 676 - 100 = 576$, so b = **24 cm**.
5	**(C)**	$7^2 = 49 < 50 < 64 = 8^2$, so √50 lies between **7 and 8**.
6	**(B)**	The sum of the first n odd numbers is n^2; for n = 12, the sum = 12^2 = **144**.
7	**(A)**	Multiply each term by 2: (5, 12, 13) → **(10, 24, 26)**. The other options are not multiples of (5, 12, 13).
8	**(D)**	$d^2 = 30^2 + 16^2 = 900 + 256 = 1156 = 34^2$, so d = **34 cm**.
9	**(C)**	$h^2 = 20^2 - 12^2 = 400 - 144 = 256$, so h = **16 ft**.
10	**(B)**	The diagonal d has $d^2 = 12^2 + 12^2 = 288$, and the area of the square on d is d^2 = **288 cm²** (double the area of the original square, 144).

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

Q11. Wooden board (Fig. 3)

(i) The brace is the hypotenuse: $c^2 = 21^2 + 72^2 = 441 + 5184 = 5625$, so c = **75 cm** ($75^2 = 5625$). [1]

(ii) 1 m = 100 cm; leftover = 100 − 75 = **25 cm**. [1]

Q12.

(A) The longest side is 53. $28^2 + 45^2 = 784 + 2025 = 2809$. [1]

$53^2 = 2809$, so $a^2 + b^2 = c^2$; the triangle **is right-angled** (by the Baudhāyana-Pythagoras Theorem). [1]

(B) For an isosceles right triangle $c^2 = 2a^2$. So $(\sqrt{98})^2 = 98 = 2a^2$. [1]

$a^2 = 49$, so a = **7 cm**. [1]

Q13.

$d^2 = 9^2 + 9^2 = 162$ (or 2 × 81), so the diagonal is **√162 cm**. [1]

$12^2 = 144 < 162 < 169 = 13^2$, so it lies between **12 and 13**. [1]

Section C – Short Answer Questions (3 marks each)

Q14. Pole and wires (Fig. 4)

(i) Wire 1: $c^2 = 24^2 + 7^2 = 576 + 49 = 625$, so wire 1 = **25 m**. [1]

(ii) Wire 2: $c^2 = 24^2 + 18^2 = 576 + 324 = 900$, so wire 2 = **30 m**. [1]

(iii) Wire 2 is longer by 30 − 25 = **5 m**. [1]

Q15.

(A) 49 = 2n − 1, so n = 25. [1]

Substituting in $(n - 1)^2 + (2n - 1) = n^2$: $24^2 + 49 = 25^2$, i.e. $24^2 + 7^2 = 25^2$. [1]

Check: $576 + 49 = 625 = 25^2$. The triple is **(7, 24, 25)**. [1]

(B) $81 = 2n - 1$, so $n = 41$. [1]

$(41 - 1)^2 + 81 = 41^2$, i.e. $40^2 + 9^2 = 41^2$. [1]

Check: $1600 + 81 = 1681 = 41^2$. The triple is **(9, 40, 41)**. [1]

Q16.

(A) The diagonals of a rhombus bisect each other at right angles, so each side is the hypotenuse of a right triangle with legs 9 cm and 40 cm. [1]

Side$^2 = 9^2 + 40^2 = 81 + 1600 = 1681$, so side = **41 cm**. [1]

Perimeter $= 4 \times 41 =$ **164 cm**. [1]

(B) In an equilateral triangle the altitude from a vertex splits it into two congruent right triangles (the altitude bisects the base), so the half-base is 5 cm. [1]

$h^2 = 10^2 - 5^2 = 100 - 25 =$ **75**. [1]

$8^2 = 64 < 75 < 81 = 9^2$, so the altitude lies between **8 cm and 9 cm**. [1]

Q17.

(A) $1.41^2 = 1.9881 < 2$ and $1.42^2 = 2.0164 > 2$. [1½]

Since $(\sqrt{2})^2 = 2$ lies between 1.41^2 and 1.42^2, we get **$1.41 < \sqrt{2} < 1.42$**. [1½]

(B) $20^2 + 21^2 = 400 + 441 = 841 = 29^2$, so it is a triple. $20 = 2^2 \cdot 5$, $21 = 3 \cdot 7$ have no common factor greater than 1, so it is **primitive**. [1]

Scaled version for k = 2: (40, 42, 58). [1]

Check: $40^2 + 42^2 = 1600 + 1764 = 3364 = 58^2$. [1]

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

Q18.

(A) (i) Side of a square = √area: shorter sides are $\sqrt{36} =$ **6 cm** and $\sqrt{64} =$ **8 cm**. [1]

(ii) Area on hypotenuse = $36 + 64 =$ **100 cm^2** ($a^2 + b^2 = c^2$). [1]

(iii) Hypotenuse = $\sqrt{100} =$ **10 cm**. [1]

(iv) Perimeter $= 6 + 8 + 10 =$ **24 cm**. [1]

(B) (i) Distance$^2 = 24^2 + 10^2 = 576 + 100 = 676$, so distance = **26 km**. [2]

(ii) Distance$^2 = 32^2 + 10^2 = 1024 + 100 = 1124$. [1] $33^2 = 1089 < 1124 < 1156 = 34^2$, so it lies between **33 km and 34 km**. [1]

Q19.

(A) (i) Reed length = x + 2 (2 units above water). [1]

(ii) Right triangle with sides 6, x and (x + 2): $6^2 + x^2 = (x + 2)^2$. [1]

(iii) $36 + x^2 = x^2 + 4x + 4$, so $36 = 4x + 4$, $4x = 32$, **x = 8 units**. [1]

(iv) Reed length $= 8 + 2 =$ **10 units**. (Check: $6^2 + 8^2 = 100 = 10^2$.) [1]

(B) (i) LHS $= 4m^2 + (m^4 - 2m^2 + 1) = m^4 + 2m^2 + 1$. [1]

RHS $= (m^2 + 1)^2 = m^4 + 2m^2 + 1 =$ LHS. Hence proved. [1]

(ii) For m = 6: $2m = 12$, $m^2 - 1 = 35$, $m^2 + 1 = 37$. The triple is **(12, 35, 37)**. [1]

(iii) $12^2 + 35^2 = 144 + 1225 = 1369 = 37^2$. ✓ [1]

Q20. Case Study: Playground

(i) Diagonal$^2 = 48^2 + 55^2 = 2304 + 3025 = 5329 = 73^2$, so the diagonal is **73 m**. [1]

(ii) Along two sides = 48 + 55 = 103 m; saving = 103 − 73 = **30 m**. [1]

(iii) Wire$^2 = 20^2 + 21^2 = 400 + 441 = 841 = 29^2$, so the wire is **29 m**. [1]

(iv) Diagonal$^2 = 10^2 + 10^2 = 200$. $14^2 = 196 < 200 < 225 = 15^2$, so it lies between **14 m and 15 m**. [1]

Note for teachers: Award full marks for any correct alternative method. In Q13, Q16(B), Q18(B)(ii) and Q20(iv), the bounds must be justified by squares of whole numbers. Units must be stated in the final answers.