CLASS 8 · MATHEMATICS

The Baudhayana-Pythagoras Theorem

Sample paper · 15 questions · 22 marks

10 objective questions × 1 mark. Five written-response questions: 12 marks. Write your working where needed. Suggested time: 45 minutes. Answers and marking guidance follow the questions.

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Section A · Objective questions (10 marks)

1. A right triangle has perpendicular sides 9 cm and 12 cm. Its hypotenuse is:

A. 15 cm

B. 18 cm

C. 21 cm

D. 13 cm

2. Which equation holds when h is the hypotenuse and u, v are the legs?

A. $u^2=h^2+v^2$

B. $h=u+v$

C. $h^2=u^2+v^2$

D. $h^2=u^2-v^2$

3. A right triangle has hypotenuse 17 and one leg 8. The other leg is:

A. 9

B. 12

C. 15

D. 25

4. Which set can be the sides of a right triangle?

A. 6, 8, 11

B. 2, 3, 8

C. 6, 8, 10

D. 4, 4, 9

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5. The diagonal of a square of side 4 cm is:

A. $4\sqrt{2}$ cm

B. 16 cm

C. 8 cm

D. $2\sqrt{2}$ cm

6. A rectangle has sides 7 and 24 units. Its diagonal is:

A. 25

B. 49

C. 17

D. 31

7. In a right triangle, the side opposite the right angle is called the:

A. Median

B. Base of every triangle

C. Radius

D. Hypotenuse

8. Do the lengths 7, 10 and 12 form a right triangle?

A. No triangle is possible

B. Yes, because $7+10>12$

C. No, because $7^2+10^2\neq12^2$

D. Yes, because all are integers

9. A ladder reaches 12 m up a wall with its foot 5 m from the wall. Its length is:

A. 17 m

B. 60 m

C. 7 m

D. 13 m

10. The hypotenuse of a non-degenerate right triangle is:

A. The sum of both legs

B. Longer than each leg

C. Always equal to a leg

D. Shorter than each leg

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Section B · Written responses (12 marks)

Attempt all five. Use a separate sheet if you need more space. The marks for each question are shown.

11. Find the diagonal of a square with side 6 cm. Give an exact value and a decimal approximation to two places. [2 marks]

12. A rhombus has diagonals of 18 and 24 units. Find its side length, explaining which triangle you use. [2 marks]

13. Using positive side lengths a, b and hypotenuse c, justify why c is longer than either leg. [2 marks]

14. Give five different rectangles whose two side lengths and diagonal are positive integers. Check one example using the theorem. [3 marks]

15. Find the area of an equilateral triangle of side 8 units. Explain why its altitude divides the base into two equal parts. [3 marks]

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Answers & marking guidance

Use these after attempting the paper. Accept equivalent correct reasoning and sensible units. These are Evater model answers, not an official marking scheme.

Section A · 1 mark each

1. A — $\sqrt{(9^2+12^2)}=\sqrt{225}=15$ cm.

2. C — The square of the hypotenuse equals the sum of the squares of the legs.

3. C — $\sqrt{(17^2-8^2)}=\sqrt{225}=15$.

4. C — $6^2+8^2=10^2$, and the triangle inequality holds.

5. A — $d^2=4^2+4^2=32$, hence $d=4\sqrt{2}$ cm.

6. A — $\sqrt{(7^2+24^2)}=\sqrt{625}=25$.

7. D — The hypotenuse is opposite the right angle.

8. C — They form a triangle, but $49+100=149$, not 144.

9. D — The wall and level ground are perpendicular: $\sqrt{(12^2+5^2)}=13$ m.

10. B — For positive legs, h^2 exceeds each individual leg square.

Section B · Model answers

11. $d^2=6^2+6^2=72$. Thus $d=6\sqrt{2}$ cm, approximately 8.49 cm.

Marking: 1 mark for the correct right-triangle equation; 1 for $6\sqrt{2}$ cm with a suitable approximation.

12. The diagonals bisect at right angles, giving legs 9 and 12. A rhombus side is $\sqrt{(9^2+12^2)}=15$ units.

Marking: 1 mark for half-diagonals 9 and 12 as perpendicular legs; 1 for 15 units.

13. $c^2=a^2+b^2$. Since both leg lengths are positive, $c^2>a^2$ and $c^2>b^2$. Taking positive square roots gives $c>a$ and $c>b$.

Marking: 1 mark for the theorem and positive-square comparison; 1 for the correct conclusion. Accept another sound justification.

14. Examples (side, side, diagonal): (9,12,15), (12,16,20), (10,24,26), (16,30,34), (14,48,50). For example $9^2+12^2=81+144=225=15^2$. Other valid integer triples are accepted, including scaled triples.

Marking: 0 marks for no valid examples; 1 for one or two; 2 for three or four; 3 for five valid examples with at least one correct check. Five without a check: 2 marks. Reordered duplicates count once.

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15. The altitude creates two right triangles with equal hypotenuses 8 and a shared leg, so they are congruent and the half-bases are 4. The height is $\sqrt{(8^2-4^2)}=4\sqrt{3}$. Area=$\frac{1}{2}\times 8\times 4\sqrt{3}=16\sqrt{3}$ square units, about 27.71.

Marking: 1 mark for justifying half-base 4; 1 for height $4\sqrt{3}$; 1 for area $16\sqrt{3}$ square units.

Topic references

Concept reference: the Pythagorean theorem. All numerical examples in this paper have been independently calculated.

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