Pythagoras Theorem

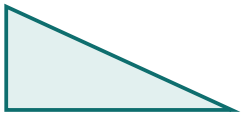
Unit: Geometry and Triangles - Student Practice Worksheet

Overview: Kabir wanted to know the diagonal length of a rectangular field, 3 m by 4 m, without walking across it. Zara said one right-angled triangle and one theorem would do it. The answer came out to be a suspiciously round number.

Practice Questions (30 Total)

Section A - Easy

Q1. Right triangle, legs 3 and 4. Hypotenuse?



legs 3 and 4

- [ ] **A.** 7
- [ ] **B.** 5
- [ ] **C.** 12
- [ ] **D.** 25

Q2. What is the Pythagoras theorem formula?

- [ ] **A.** $c^2 = a^2 + b^2$
- [ ] **B.** $c = a + b$
- [ ] **C.** $c^2 = a^2 – b^2$
- [ ] **D.** $a^2 = b^2 + c^2$

Q3. What is the hypotenuse in a right triangle?

- [ ] **A.** The shortest side
- [ ] **B.** Any of the three sides
- [ ] **C.** The side opposite the right angle, always longest
- [ ] **D.** The side adjacent to the right angle

Q4. Right triangle, legs 5 and 12. Hypotenuse?

legs 5 and 12

- [ ] **A.** 17
- [ ] **B.** 7
- [ ] **C.** 60
- [ ] **D.** 13

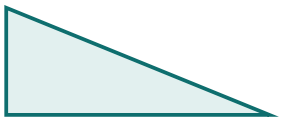
Q5. Does the Pythagoras theorem apply to all triangles?

- [ ] **A.** Yes, all triangles
- [ ] **B.** Only right-angled triangles
- [ ] **C.** Only equilateral triangles
- [ ] **D.** Only obtuse triangles

Q6. A right triangle has hypotenuse 10 and one leg 6. Find the other leg.

- [ ] **A.** 4
- [ ] **B.** 16
- [ ] **C.** 8
- [ ] **D.** 64

Q7. Right triangle, legs 8 and 15. Hypotenuse?



legs 8 and 15

- [ ] **A.** 23
- [ ] **B.** 17
- [ ] **C.** 7
- [ ] **D.** 289

Q8. What does the converse of the Pythagoras theorem help you check?

- [ ] **A.** Whether a triangle has equal sides
- [ ] **B.** Whether a triangle is equilateral
- [ ] **C.** The perimeter of a triangle
- [ ] **D.** Whether a triangle is right-angled

Q9. Check: does $6^2 + 8^2$ equal 10^2?

- A. Yes: both equal 100
- B. No: 100 and 64
- C. No: 48 and 100
- D. Yes: both equal 64

Q10. Which triple is Pythagorean, and how do you check with squares?

- A. 3, 4, 5
- B. 2, 3, 4
- C. 4, 5, 6
- D. 5, 6, 7

Section B - Medium

Q11. Ladder 13 m, base 5 m from the wall. How high does it reach?

ladder 13, base 5

- A. 12 m
- B. 8 m
- C. 18 m
- D. 9 m

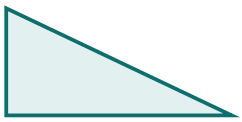
Q12. Is a triangle with sides 7, 24, 25 right-angled?

- A. No: they don't satisfy the theorem
- B. Yes: $7^2+24^2=625=25^2$
- C. Cannot be determined
- D. Only if all angles are equal

Q13. A rectangular field is 6 m by 8 m. Find the diagonal.

- A. 14 m
- B. 48 m
- C. 10 m
- D. 100 m

Q14. Hypotenuse 25, one leg 7. Other leg?



hyp 25, leg 7

- [ ] **A.** 18
- [ ] **B.** 32
- [ ] **C.** 576
- [ ] **D.** 24

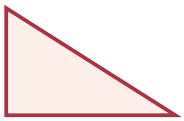
Q15. A 15 m tall pole casts a shadow, and the distance from the pole's base to the tip of the shadow is 20 m in a straight line. What is that straight-line distance formula using?

- [ ] **A.** Pythagoras theorem, on the right triangle formed
- [ ] **B.** The angle sum property
- [ ] **C.** The exterior angle theorem
- [ ] **D.** Simple addition of the two

Q16. A right triangle has legs in ratio 3:4 and hypotenuse 20. Find the shorter leg.

- [ ] **A.** 16
- [ ] **B.** 12
- [ ] **C.** 15
- [ ] **D.** 9

Q17. Both legs 6. Hypotenuse to two decimal places?



equal legs 6 and 6

- [ ] **A.** 12
- [ ] **B.** 8.49
- [ ] **C.** 6
- [ ] **D.** 36

Q18. A square has a diagonal of 10 cm. Find the side length, to two decimal places.

- [ ] **A.** 5 cm
- [ ] **B.** 10 cm

- [ ] **C.** 7.07 cm
- [ ] **D.** 14.14 cm

Q19. Two right triangles share the same hypotenuse of 13, and one has legs 5,12. If the other has one leg of 12, what is its other leg?

- [ ] **A.** 7
- [ ] **B.** 13
- [ ] **C.** 1
- [ ] **D.** 5, the same as the first triangle

Q20. Sides 5, 6, 7: right-angled or not, by comparing squares?

- [ ] **A.** No, since 5^2+6^2 isn't 7^2
- [ ] **B.** Yes, it is right-angled
- [ ] **C.** Needs a protractor to tell
- [ ] **D.** Yes, all sides differ

Section C - Challenge

Q21. Rectangle length 12, diagonal 13. Width, then perimeter?

length 12, diagonal 13

- [ ] **A.** Width 5, perimeter 34
- [ ] **B.** Width 5, perimeter 30
- [ ] **C.** Width 7, perimeter 38
- [ ] **D.** Width 12, perimeter 48

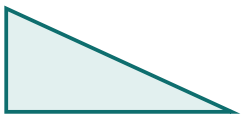
Q22. Two right triangles both have hypotenuse 25. One has legs 7,24 and the other has legs 15,20. Do both genuinely satisfy the Pythagoras theorem?

- [ ] **A.** Only the first does
- [ ] **B.** Only the second does
- [ ] **C.** Yes, both check out exactly
- [ ] **D.** Neither does

Q23. Two poles of heights 6 m and 11 m stand 12 m apart on flat ground. Find the distance between their tops.

- [ ] **A.** 17 m
- [ ] **B.** 13 m
- [ ] **C.** 5 m
- [ ] **D.** 23 m

Q24. Right triangle area 24, legs in ratio 3:4. Hypotenuse?



area 24, legs 3:4

- [ ] **A.** 12
- [ ] **B.** 8
- [ ] **C.** 14
- [ ] **D.** 10

Q25. A triangle has sides 9, 40, and 41. Verify if it's right-angled, and identify the hypotenuse.

- [ ] **A.** No, not right-angled
- [ ] **B.** Yes, right-angled; hypotenuse is 40
- [ ] **C.** Yes, right-angled; hypotenuse is 41
- [ ] **D.** Cannot be determined

Q26. A right triangle's hypotenuse is 3 times its shorter leg. If the shorter leg is 5, find the longer leg, to two decimal places.

- [ ] **A.** 15
- [ ] **B.** 14.14
- [ ] **C.** 10
- [ ] **D.** 12.25

Q27. Cuboid 3 by 4 by 12. Space diagonal, via two Pythagoras steps?

3 by 4 by 12 cuboid

- [ ] **A.** 13
- [ ] **B.** 19

- [ ] **C.** 12
- [ ] **D.** 144

Q28. Which of these triples is NOT a valid Pythagorean triple: (a) 9,12,15 (b) 6,8,10 (c) 10,24,26 (d) 7,10,13?

- [ ] **A.** 9,12,15
- [ ] **B.** 7,10,13
- [ ] **C.** 6,8,10
- [ ] **D.** 10,24,26

Q29. A ladder of length L leans against a wall, reaching 12 m up, with its base 9 m from the wall. If the base is pulled out to 12 m instead (same ladder length L), how high does it now reach?

- [ ] **A.** 12 m
- [ ] **B.** 15 m
- [ ] **C.** 3 m
- [ ] **D.** 9 m, since $15^2 – 12^2 = 81$

Q30. Square base 6, height 4: slant from apex to base side, from height and half-diagonal.

- [ ] **A.** ≈5.83
- [ ] **B.** 7
- [ ] **C.** 5
- [ ] **D.** 4

Answer Key

Q1: (B) (b) 5. $3^2+4^2=9+16=25$, and $\sqrt{25}=5$.

Q2: (A) (a) $c^2 = a^2 + b^2$. The square of the hypotenuse equals the sum of the squares of the other two sides.

Q3: (C) (c) The side opposite the right angle, always longest. It is always the longest side of the triangle.

Q4: (D) (d) 13. $5^2+12^2=25+144=169$, $\sqrt{169}=13$.

Q5: (B) (b) Only right-angled triangles. The theorem specifically requires a right angle to hold true.

Q6: (C) (c) 8. $10^2-6^2=100-36=64$, $\sqrt{64}=8$.

Q7: (B) (b) 17. $8^2+15^2=64+225=289$, $\sqrt{289}=17$.

Q8: (D) (d) Whether a triangle is right-angled. It uses the same equation to test rather than to compute a missing side.

Q9: (A) (a) Yes: both equal 100. $36+64=100$ and $10^2=100$, confirming a right angle.

Q10: (A) (a) 3, 4, 5. $3^2+4^2=25=5^2$, a genuine match.

Q11: (A) (a) 12 m. $13^2-5^2=169-25=144$, and $\sqrt{144}=12$ — the familiar 5-12-13 Pythagorean triple.

Q12: (B) (b) Yes: $7^2+24^2=625=25^2$. $49+576=625$, matching $25^2=625$ exactly.

Q13: (C) (c) 10 m. $6^2+8^2=36+64=100$, $\sqrt{100}=10$.

Q14: (D) (d) 24. $25^2-7^2=625-49=576$, $\sqrt{576}=24$.

Q15: (A) (a) Pythagoras theorem, treating the pole, ground, and line as a right triangle. The pole (vertical) and ground (horizontal) form a right angle, making the direct line the hypotenuse.

Q16: (B) (b) 12. This is a scaled 3-4-5 triple: $20/5=4$, so legs are $3\times4=12$ and $4\times4=16$; the shorter is 12.

Q17: (B) (b) 8.49. $6^2+6^2=72$, $\sqrt{72}\approx8.49$.

Q18: (C) (c) 7.07 cm. For a square, $\text{diagonal}^2 = \text{side}^2+\text{side}^2=2\times\text{side}^2$, so $\text{side}=\sqrt{(100/2)}=\sqrt{50}\approx7.07$.

Q19: (D) (d) 5, the same as the first triangle. $13^2-12^2=169-144=25$, $\sqrt{25}=5$ — the same 5-12-13 triple, just relabelled.

Q20: (A) (a) No, since $5^2+6^2\neq7^2$. $25+36=61$, but $7^2=49$; they don't match, so it's not right-angled.

Q21: (A) (a) Width 5, perimeter 34. $13^2-12^2=169-144=25$, width=5; perimeter=$2(12+5)=34$.

Q22: (C) (c) Yes, both check out exactly. $7^2+24^2=49+576=625=25^2$, and $15^2+20^2=225+400=625=25^2$ — two genuinely different Pythagorean triples sharing the same hypotenuse.

Q23: (B) (b) 13 m. Height difference=5, horizontal distance=12, forming a right triangle: $\sqrt{(5^2+12^2)}=\sqrt{(25+144)}=\sqrt{169}=13$.

Q24: (D) (d) 10. Legs=3k,4k; area=(1/2)(3k)(4k)=6k²=24, so k²=4, k=2; legs=6,8; hypotenuse=√(36+64)=10.

Q25: (C) (c) Yes, right-angled; hypotenuse is 41. 9²+40²=81+1600=1681=41², confirming it, with 41 as the longest side.

Q26: (B) (b) 14.14. Hypotenuse=15; longer leg²=15²–5²=225–25=200, √200≈14.14.

Q27: (A) (a) 13. First find the base diagonal: √(3²+4²)=5. Then the space diagonal: √(5²+12²)=√169=13, applying Pythagoras twice.

Q28: (B) (b) 7,10,13. 7²+10²=49+100=149, but 13²=169 — these don't match, unlike the other three, which are all genuine scaled multiples of 3-4-5, 3-4-5, and 5-12-13.

Q29: (D) (d) 9 m, since 15²–12²=81. First find L: 9²+12²=81+144=225, L=15. Then with new base 12: height²=15²–12²=225–144=81, height=9.

Q30: (A) (a) ≈5.83. Using Pythagoras with height 4 and half-diagonal ≈4.24: √(4²+4.24²)≈√(16+18)=√34≈5.83.

You've got this! Keep learning and shining! - Ruchi Math Coaching