Triangle sides, medians and altitudes — Teacher answers

Year 8, upper volume • text pp. 1–4 • foundation lessons 1–2

Use the worked model and guided attempt selectively, then the eight core questions. Keep further practice and extensions optional. Ask for a reason and an original-equation or expansion check.

Worked example 1

Which three lengths can form a nondegenerate triangle? Show the shortest-two-sides test.

A. 4,6,9
B. 2,3,5
C. 1,4,6
D. 0,4,4

Reference answer

4,6,9

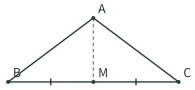
1. All three lengths must be positive.
2. For 4,6,9, the test is 4+6=10>9. Equality would place the segments on one line.

- Choose the statement justified by the stated conditions and explain why.

Guided attempt 2

M is the midpoint of BC and BC=12 cm. Explain why AM is a median and find BM.

1. BM=MC because ___.
2. AM joins ___ to ___; BM=___ cm.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

AM joins vertex A to the midpoint M; BM=6 cm.

1. A median joins a vertex to the midpoint of its opposite side.
2. BM=MC=BC/2=12/2=6 cm.

- Name the relevant vertex, opposite side and defining condition.

Prerequisite 3

Which requirement is missing from lengths 0,5,5?

A. Two sides must be equal.
B. The sides must be integers.
C. Every side must have positive length.
D. The perimeter must exceed 20.

Reference answer

Every side must have positive length.

1. A side of length zero collapses two vertices.
2. The shortest-side sum is also only 0+5=5, not greater than 5.

- Choose the statement justified by the stated conditions and explain why.

Prerequisite 4

A triangle has sides 5,5,8 cm. Find its perimeter.

Reference answer

18 cm.

$$5+5+8$$

1. Add all three side lengths.
2. 5+5+8=18 cm; 5+5>8 also confirms feasibility.

- Use the stated relationship and show the calculation.
- State the result with its unit where appropriate.

Independent practice 5

Can lengths 3,7,10 form a triangle?

A. No: 3+7=10, and the inequality must be strict.
B. Yes: the two sides add to the third.
C. Yes: all lengths are positive.
D. Only if it is a right triangle.

Reference answer

No: 3+7=10, and the inequality must be strict.

1. Compare the shorter-side sum with the longest side.
2. 3+7=10 gives a straight configuration, not a triangle.

- Choose the statement justified by the stated conditions and explain why.

Independent practice 6

An isosceles triangle has equal sides 6 cm and base 9 cm. Find its perimeter and check feasibility.

Reference answer

21 cm.

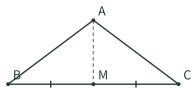
$$6+6+9$$

1. The sides are 6,6,9, with 6+6>9.
2. The perimeter is 6+6+9=21 cm.

- Use the stated relationship and show the calculation.
- State the result with its unit where appropriate.

Independent practice 7

AM is a median of △ABC and BC=15 cm. Find BM.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

7.5 cm.

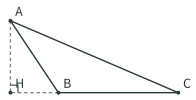
$$15/2$$

1. The median ends at midpoint M, so BM=MC.
2. BM=15/2=7.5 cm.

- Use the stated relationship and show the calculation.
- State the result with its unit where appropriate.

Independent practice 8

H lies on the line BC extended and AH⊥BC. Is AH an altitude of △ABC even though H is outside segment BC? Explain.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

Yes. An altitude meets the line containing the opposite side, not necessarily the segment itself.

1. AH starts at vertex A and is perpendicular to the line BC.
2. Those are the defining conditions; H may lie on the extension in an obtuse triangle.

- Name the relevant vertex, opposite side and defining condition.

Exit question 9

Can 4,4,8 cm form a triangle? Give one decisive calculation.

A. No, because 4+4=8.
B. Yes, because two sides are equal.
C. Yes, because its perimeter is 16.
D. Only if the longest side is the base.

Reference answer

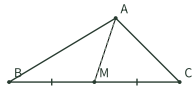
No, because 4+4=8.

1. The shortest two sides must sum to more than the longest.
2. Here equality holds, so the vertices would be collinear.

- Choose the statement justified by the stated conditions and explain why.

Exit question 10

A median AM is drawn with M the midpoint of BC. Does "median" alone mean AM⊥BC? Explain.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

No. The midpoint condition defines a median; perpendicularity is an additional condition.

1. A median specifies where its endpoint lies, not the angle it makes.
2. For A=(1,3), B=(−4,0), C=(4,0), M=(0,0), M is the midpoint but AM is not perpendicular to BC.

- Name the relevant vertex, opposite side and defining condition.

Further practice 11

Two sides are 4 cm and 9 cm. Which offered third side makes a triangle?

A. 13 cm
B. 14 cm
C. 8 cm
D. 5 cm

Reference answer

8 cm

1. The third side must be greater than 9−4=5 and less than 9+4=13.
2. Only 8 is strictly between the limits.

- Choose the statement justified by the stated conditions and explain why.

Further practice 12

A triangle has sides 2.5,3.5,4 cm. Find its perimeter.

Reference answer

10 cm.

$$2.5 + 3.5 + 4$$

1. All lengths are positive and 2.5+3.5>4.
2. 2.5+3.5+4=10 cm.

- Use the stated relationship and show the calculation.
- State the result with its unit where appropriate.

Further practice 13

AM is a median and BC=18 cm. Find CM.

Reference answer

9 cm.

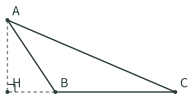
$$18/2$$

1. M is the midpoint, so CM=BM=BC/2.
2. CM=18/2=9 cm.

- Use the stated relationship and show the calculation.
- State the result with its unit where appropriate.

Further practice 14

In the diagram, which given condition makes AH an altitude from A?



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

H lies on line BC and AH⊥BC.

1. The opposite side to A is BC.
2. The perpendicular from A to the line BC is an altitude.

- Name the relevant vertex, opposite side and defining condition.

Extension 15

An isosceles triangle has two stated side lengths 4 cm and 9 cm. Which equal-side choice is possible?

A. Both choices are possible.
B. Neither choice is possible.
C. Equal sides 9 cm, base 4 cm.
D. Equal sides 4 cm, base 9 cm.

Reference answer

Equal sides 9 cm, base 4 cm.

1. If the equal sides are 4, then 4+4<9, so that case fails.
2. If the equal sides are 9, then 9+4>9; the triangle exists.

- Choose the statement justified by the stated conditions and explain why.

Extension 16

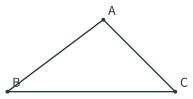
Does a vertex angle bisector always bisect the opposite side? Test the shown unequal-side triangle.

A. Yes, by the definition of bisector.

B. Yes, for every triangle with positive sides.

C. Only the drawing direction matters.

D. No; angle equality alone does not give a midpoint.



Geometry diagram; not drawn to scale except for construction tasks.

Reference answer

No; angle equality alone does not give a midpoint.

1. An angle bisector divides an angle, whereas a median divides a side.
2. In A=(0,3), B=(−4,0), C=(3,0), the side lengths AB=5 and AC=$\sqrt{18}$ differ; the internal bisector meets BC away from its midpoint.

- Choose the statement justified by the stated conditions and explain why.