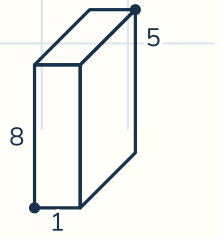
Spider and fly — Edges up to 20

Name: _____ Date: _____

A bug crosses the outside of a box, corner to corner. Find the shortest path on the surface, and show the unfolding.

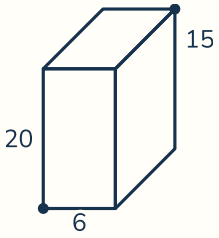
1 A beetle starts at a corner of a 1 × 5 × 8 wooden crate and heads for the corner furthest away, keeping to the surface the whole time.



What is the shortest distance across the surface?

Why

2 A spider sits in one corner of a room 6 × 15 × 20 and a fly rests in the far opposite corner. The spider must travel across the walls, floor and ceiling — never through the air.



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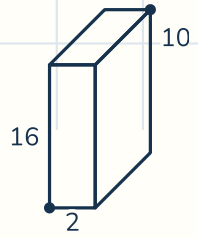
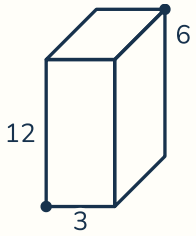
3 A spider sits in one corner of a room 2 × 10 × 16 and a fly rests in the far opposite corner. The spider must travel across the walls, floor and ceiling — never through the air.



What is the shortest distance across the surface?

Why

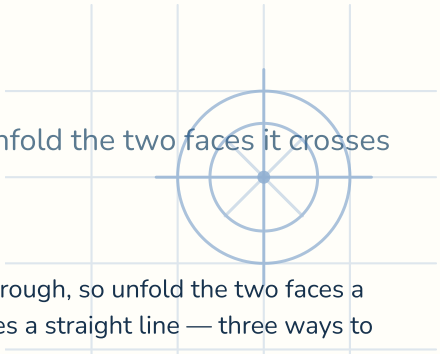
4 A spider sits in one corner of a room 3 × 6 × 12 and a fly rests in the far opposite corner. The spider must travel across the walls, floor and ceiling — never through the air.



What is the shortest distance across the surface?

Why

Spider and fly · Edges up to 20 — Answer key



If they are stuck

- The bug stays on the surface. What happens to a bent path when you unfold the two faces it crosses flat?

1. The beetle cannot cut through, so unfold the two faces a path crosses and it becomes a straight line — three ways to pick the two faces, three flat distances to compare. Pairing the two shorter edges puts 1 + 5 = 6 along one side and 8 along the other. By Pythagoras, 6 × 6 = 36 and 8 × 8 = 64, together 100; and 10 × 10 = 100, so that path is 10. The other two unfoldings come out to squared lengths 106 and 170, both longer, and cutting straight THROUGH the crate would be shorter but leaves the surface. Shortest path: 10.

2. The spider cannot cut through, so unfold the two faces a path crosses and it becomes a straight line — three ways to pick the two faces, three flat distances to compare. Pairing the two shorter edges puts 6 + 15 = 21 along one side and 20 along the other. By Pythagoras, 21 × 21 = 441 and 20 × 20 = 400, together 841; and 29 × 29 = 841, so that path is 29. The other two unfoldings come out to squared lengths 901 and 1261, both longer, and cutting straight THROUGH the room would be shorter but leaves the surface. Shortest path: 29.

3. The spider cannot cut through, so unfold the two faces a path crosses and it becomes a straight line — three ways to pick the two faces, three flat distances to compare. Pairing the two shorter edges puts 2 + 10 = 12 along one side and 16 along the other. By Pythagoras, 12 × 12 = 144 and 16 × 16 = 256, together 400; and 20 × 20 = 400, so that path is 20. The other two unfoldings come out to squared lengths 424 and 680, both longer, and cutting straight THROUGH the room would be shorter but leaves the surface. Shortest path: 20.

4. The spider cannot cut through, so unfold the two faces a path crosses and it becomes a straight line — three ways to pick the two faces, three flat distances to compare. Pairing the two shorter edges puts 3 + 6 = 9 along one side and 12 along the other. By Pythagoras, 9 × 9 = 81 and 12 × 12 = 144, together 225; and 15 × 15 = 225, so that path is 15. The other two unfoldings come out to squared lengths 261 and 333, both longer, and cutting straight THROUGH the room would be shorter but leaves the surface. Shortest path: 15.