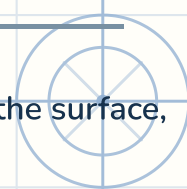


Spider and fly — Edges up to 20

Name: _____

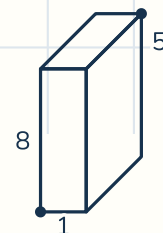
Date: _____



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 $1 \times 5 \times 8$ wooden crate and heads for the corner furthest away, keeping to the surface the whole time.

What is the shortest distance across the surface?

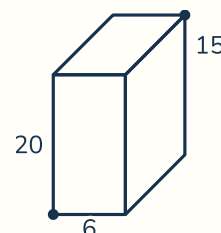


Why The beetle cannot cut through, so unfold the two faces a path crosses and it becomes a straight line — three ways to pick the two faces, three flat distances to compare. Pairing the two shorter edges puts $1 + 5 = 6$ along one side and 8 along the other. By Pythagoras, $6 \times 6 = 36$ and $8 \times 8 = 64$, together 100; and $10 \times 10 = 100$, 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.

10

- 2 A spider sits in one corner of a room $6 \times 15 \times 20$ 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

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Spider and fly — Edges up to 20

Name: _____

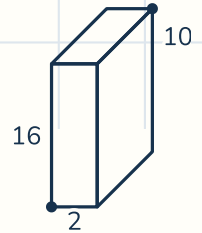
Date: _____



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

- 3 A spider sits in one corner of a room $2 \times 10 \times 16$ 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

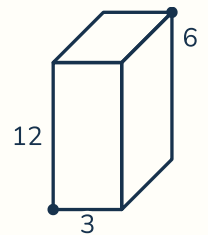
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- 4 A spider sits in one corner of a room $3 \times 6 \times 12$ and a fly rests in the far opposite corner. The spider must travel across the walls, floor and ceiling — never through the air.

What is the shortest distance across the surface?



Why

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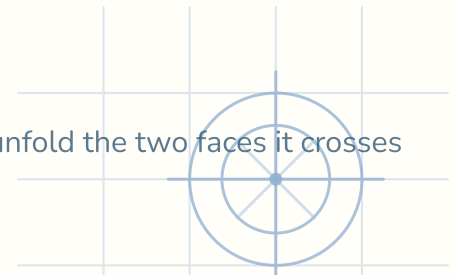
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Spider and fly · Edges up to 20 — Answer key

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, $6 \times 6 = 36$ and $8 \times 8 = 64$, together 100; and $10 \times 10 = 100$, 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.

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, $12 \times 12 = 144$ and $16 \times 16 = 256$, together 400; and $20 \times 20 = 400$, 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.

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, $21 \times 21 = 441$ and $20 \times 20 = 400$, together 841; and $29 \times 29 = 841$, 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.

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, $9 \times 9 = 81$ and $12 \times 12 = 144$, together 225; and $15 \times 15 = 225$, 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.