Solid Geometry Worksheet · Parent Answers

Parent answers

01

These answers show the key relationship and result. Equivalent reasoning is also valid.

1. State V, E and F for a hexagonal prism and verify Euler's relation.

   Suggested answer

   V=12, E=18, F=8; 12−18+8=2.

2. A right cylinder has radius 1 and height 3. Find its volume and total surface area.

   Suggested answer

   Volume 3π; total surface area 8π.

3. Why is a connected arrangement of six squares not always a cube net? Draw a non-example.

   Suggested answer

   Folding can overlap faces. A 2×3 rectangle of squares is a non-example.

4. On the lateral surface of a cylinder of radius 1 and height 2, find the shortest path between opposite bottom/top points separated by half a turn.

   Suggested answer

   Unroll to a π-by-2 rectangle: $\sqrt{(\pi^2+4)} \approx 3.724$.

5. Two side-by-side stacks have heights 1 and 3. How many top-view cells are occupied, and how tall is the highest front-view column?

   Suggested answer

   Two occupied cells; maximum height three.

6. A horizontal square has area 16. Under our half-depth, 45° oblique convention, find its image area.

   Suggested answer

   Multiply by $(1/2)\sin 45° = \sqrt{2}/4$, giving $4\sqrt{2}$.

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02

These answers show the key relationship and result. Equivalent reasoning is also valid.

7. A cube of edge 2 has a central regular hexagonal section. Find its side count and area.

> **Suggested answer**
>
> Six sides of length $\sqrt{2}$; area $3\sqrt{3}$.

8. Does translating a cutting plane without rotating it always preserve the section's side count? Give an example.

> **Suggested answer**
>
> No. A plane normal to (1,1,1) gives a central hexagon and a triangle near a vertex.

9. Find the acute angle between directions (1,1,0) and (0,1,1).

> **Suggested answer**
>
> $\cos\theta = 1/2$, so $\theta = 60°$.

10. Find the angle between direction (1,1,1) and the plane $z=0$.

> **Suggested answer**
>
> $\sin\theta = 1/\sqrt{3}$; $\theta \approx 35.264°$.

11. Find the distance from (1,2,3) to $z=0$.

> **Suggested answer**
>
> The distance is $|3| = 3$.

12. Why does translating the coordinate origin preserve a displacement vector? Explain using subtraction.

> **Suggested answer**
>
> $(B-t)-(A-t) = B-A$: the translation cancels.

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03

These answers show the key relationship and result. Equivalent reasoning is also valid.

13. Find the circumradius of a 2×3×6 cuboid.

> **Suggested answer**
> R=√49/2=3.5.

14. Find the circumradius and inradius of a regular tetrahedron of edge 2.

> **Suggested answer**
> R=√6/2, r=√6/6; R=3r.

15. When does a right cylinder of base radius 2 have an insphere tangent to every surface?

> **Suggested answer**
> Its height must be 4; the sphere radius is 2.

16. A right cone has base radius 3, height 4 and slant height 5. Find its inradius.

> **Suggested answer**
> r=3×4/(3+5)=1.5.

17. A regular tetrahedron's edge doubles. By what factors do its height, area and volume change?

> **Suggested answer**
> The factors are 2, 4 and 8 respectively.

18. What is the angle between opposite tetrahedron edges, and the circumradius:midsphere:inradius ratio?

> **Suggested answer**
> 90°; 3 : √3 : 1.