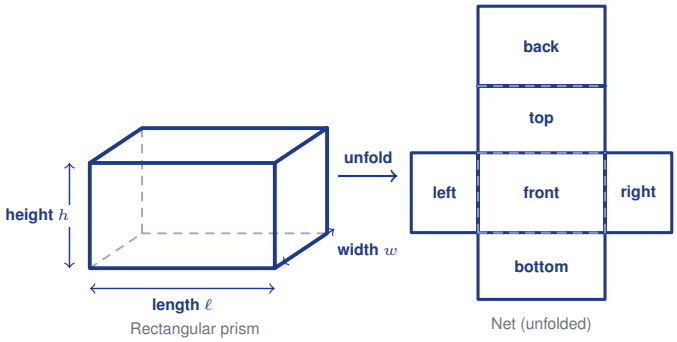
Nets and Surface Area of Prisms

Name: _____	Date: _____	Score: _____ / 17

A **net** is like an unfolded box—a flat pattern that folds up to make a three-dimensional solid. Studying a net lets you see every face of a prism at once, which makes understanding **surface area** (the total area of all the outside faces) so much easier! Once you can match each face in the net to its spot on the solid, the formulas for prisms practically explain themselves. Think of it as the bridge between 2-D and 3-D thinking!



Rectangular prism | Net (unfolded)

Key Concepts & Quick Review

Rectangular prism: $SA = 2(lw + lh + wh)$. Each term covers one pair of opposite faces.

Triangular prism: $SA = 2(\text{triangle base area}) + \text{sum of 3 rectangular face areas}$.

Any prism: $SA = 2B + Ph$, where B = base area, P = base perimeter, h = prism height.

Examples

① Find the surface area of a rectangular prism: $l = 10\ cm$, $w = 6\ cm$, $h = 4\ cm$.

Think It Through: A rectangular prism has three different face areas: lw, lh, and wh. Each one appears twice on the solid, so use $SA = 2(lw+lh+wh)$. Here that is $2(10{\cdot}6+10{\cdot}4+6{\cdot}4) = 2(60+40+24)$. Add inside the brackets first to get 124, then double it to get 248 square centimeters.

Answer: $248\ cm^2$

② A triangular prism has equilateral triangle bases with side $6\ cm$ and height of each triangle $5.2\ cm$. The prism is $10\ cm$ tall. Find the surface area.

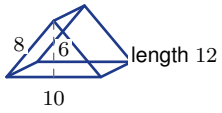
Think It Through: Start with one triangular base: $B = \frac{1}{2}(6)(5.2) = 15.6\ cm^2$. There are two congruent triangle bases, so together they contribute $2(15.6) = 31.2\ cm^2$. The lateral faces are three rectangles, each with one side $6\ cm$ and prism length $10\ cm$, so the lateral area is $3(6 \cdot 10) = 180\ cm^2$. Add base area and lateral area to get the total surface area.

Answer: $211.2\ cm^2$

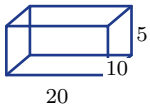
Practice Problems

Find the surface area of each prism.

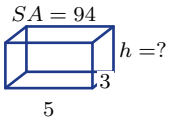
1. A rectangular prism has length 8, width 3, and height 5. Find its surface area. _____
2. A rectangular prism has length 12, width 5, and height 4. Find its surface area. _____
3. A cube has side length 6. Find its surface area. _____
4. A rectangular prism has length 10, width 2, and height 7. Find its surface area. _____
5. A rectangular prism has length 9, width 4, and height 3. Find its surface area. _____
6. A triangular prism has a triangular base with base 8, height 3, and equal sides 5 and 5. The prism length is 10. Find its surface area. _____
7. A triangular prism has a right-triangle base with legs 3 and 4 and hypotenuse 5. The prism length is 9. Find its surface area. _____
8. A rectangular prism has length 7.5, width 4, and height 2. Find its surface area. _____
9. A rectangular prism has length 15, width 8, and height 6. Find its surface area. _____
10. A cube has side length 5. Find its surface area. _____
11. A rectangular prism has length $x + 1$, width x, and height 3. If $x = 4$, find its surface area. _____
12. A triangular prism has a triangular base with base 10, height 6, and equal sides 8 and 8. The prism length is 12. Find its surface area. _____



13. A rectangular prism has length 20, width 10, and height 5. Find its surface area. _____



14. A rectangular prism has length 6, width 4, and height 3. Find its surface area. _____
15. A rectangular prism has surface area 94, length 5, and width 3. Find its height. _____



Study Tips

- **Draw the net.** Label each face's dimensions before computing any area. You can't miss a face if you sketch all 6 (or 5).
- For $SA = 2(lw + lh + wh)$: each product covers *one pair* of congruent opposite faces. The factor of 2 counts both.
- A **cube** has 6 identical square faces, so $SA = 6s^2$. Memorise this — it's the fastest cube

shortcut.

Word Problems

16. A company ships products in rectangular boxes that are $40\ cm$ long, $25\ cm$ wide, and $15\ cm$ tall. Each box is wrapped in brown paper. Find the surface area of one box. If paper costs $\$0.004$ per cm^2 and the company ships 500 boxes per day, what is the daily paper cost?

_____

17. A tent is shaped like a triangular prism. The triangular front face is a right triangle with legs $1.8\ m$ and $2.4\ m$ (hypotenuse $3.0\ m$). The tent is $3\ m$ deep, and the $2.4\ m$ side lies on the ground as the floor. Find the surface area of canvas needed (exclude the floor). If canvas costs $\$12$ per m^2, what is the material cost?

_____

Answer Keys

1) 158
2) 256
3) 216
4) 208
5) 150
6) 204
7) 120
8) 106
9) 516
10) 150
11) 94
12) 372
13) 700
14) 108
15) 4
16) $3{,}950\ cm^2$; daily cost \$7,900
17) $18.72\ m^2$; cost about \$225

Step-by-Step Explanations

Strategy: For Area of Triangles, pair the chosen base with its perpendicular height before using $A = \frac{1}{2}bh$. The height must be perpendicular to the base; that is the most important visual check.

Practice 1: Find the area of the triangle. **Answer:** $42\ sq\ in$
In the opening example, substitute the base and perpendicular height into A equals one-half base times height.

Practice 6: The area is $36\ sq\ yd$. Find h. **Answer:** $h = 8\ yd$
For the end-of-set item, substitute the base and perpendicular height into A equals one-half base times height.

Word-problem notes:

7. Answer: Area $= \frac{1}{2}(18)(11) = 99\ m^2$; cost $= 99 \times 3.50 = \$346.50$; second: $\frac{1}{2}(36)(5.5) = 99\ m^2$ — same area.
Start with the area formula for a triangle: $A = \frac{1}{2}bh$. For the first plot, $A = \frac{1}{2}(18)(11) = 99$ square meters. To find the fertilizer cost, multiply the area by the cost per square metre: $99 \times 3.50 = \$346.50$. For the second plot, the base doubles to 36 but the height halves to 5.5. Since one factor doubles and the other halves, their product stays the same, so the area is still $99\ m^2$.

8. Answer: Top: $500\ cm^2$; bottom: $700\ cm^2$; total: $1{,}200\ cm^2$; cost: $\$96$.
Treat the kite as two separate triangles and find each area first. The top triangle is $\frac{1}{2}(40)(25) = 500\ cm^2$, and the bottom triangle is $\frac{1}{2}(40)(35) = 700\ cm^2$. Add them to get the total kite area: $500 + 700 = 1{,}200\ cm^2$. Then multiply by the paper cost, $1{,}200 \times 0.08$, to get $\$96$. Splitting a composite shape into familiar pieces is often the easiest method.

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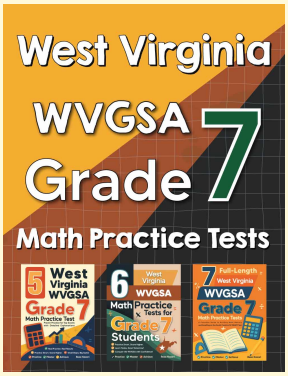

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