

WORKSHEET ANSWER KEY

Student Worksheet 1: Geometry Works! The Stage Takes Shape

- Perimeter: $2 \cdot (24 + 16) = 80$ feet
Area: $24 \cdot 16 = 384$ square feet
 - 8 feet is one-third the length of the main stage.
Circumference: $3.14 \cdot 8 = 25.12$ feet, rounded = 25 feet
Area: $3.14 \cdot 4^2 = 50.24$ square feet, rounded = 50 square feet
 - Perimeter: $8 + 6 + 10 = 24$ feet
Area: $1/2 \cdot (8 \cdot 6) = 24$ square feet
- Bonus: Trapezoid Area = $1/2 \cdot (8 + 5) \cdot 6 = 39$ square feet

Student Worksheet 2: That Should Cover It!

- $2 \cdot (3 \cdot 4 + 3 \cdot 7 + 4 \cdot 7) = 2 \cdot (12 + 21 + 28) = 2 \cdot 61 = 122$ square feet
 - $(2 \cdot 3.14 \cdot 12.25) + (3.14 \cdot 7 \cdot 7) = (76.93) + (153.86) = 230.79$ square feet, rounded = 231 square feet
 - $(4 \cdot 4) + 1/2 \cdot 16 \cdot 7.28 = 16 + 58.24 = 74.24$ square feet, rounded = 74 square feet
 - No. The total surface area is 427.03 square feet and one can of paint will cover only 350 square feet, so the stage crew needs more paint.
- Bonus: a. $(3.14 \cdot 12.25) + (3.14 \cdot 3.5 \cdot 7.8) = 38.465 + 85.722 = 124.187$ square feet, rounded = 124 square feet; b. $124.187/350 = .35482$ or about .35, or 35% of the gallon

Student Worksheet 3: Pack It Up! What Will Fit?

- a. $7 \cdot 4 \cdot 3 = 84$ cubic feet
b. $3.14 \cdot 12.25 \cdot 7 = 269.255$ cubic feet, rounded = 269 cubic feet
c. $1/3 \cdot (4 \cdot 4) \cdot 7 = 37.33$ cubic feet, rounded = 37 cubic feet
d. $84 + 269 + 37 = 390$ cubic feet
- $13 \cdot 5 \cdot 8 = 520$ cubic feet
- Yes, because the total volume of the objects is 390 cubic feet, leaving extra room volume-wise.

Bonus: The cone has a volume of $3.14 \cdot 1/3 \cdot 12.25 \cdot 7 = 89.75$ cubic feet or 89 cubic feet and 1,296 cubic inches (1,728 cubic inches = 1 cubic foot). There was approximately 130 cubic feet left in the van. So based on volume alone, there should still be enough room in the van to fit the cone.

Bonus Worksheet 1: What's the Angle?

For a wood floor, the wall angles are: $[180 - (90 + 80)] = 10^\circ$ for a maximum safe floor angle, and $[180 - (90 + 68)] = 22^\circ$ for a minimum safe floor angle.

- Since 22° is LARGER than 10° , then 22° is the MAXIMUM safe wall angle.
 - Since 10° is SMALLER than 22° , then 10° is the MINIMUM safe wall angle.
- For a carpet, the wall angles are: $[180 - (90 + 85)] = 5^\circ$ for a maximum safe floor angle, and $[180 - (90 + 30)] = 60^\circ$ for a minimum safe floor angle.
- Since 60° is LARGER than 5° , then 60° is the MAXIMUM safe wall angle.
 - Since 5° is SMALLER than 60° , then 5° is the MINIMUM safe wall angle.
 - $1/2 \cdot (8 \cdot 14) = 56$ square inches

Bonus Worksheet 2: That's a Wrap!

- The length of the poster is the same as the trash can's height and the width of the poster is equal to the trash can's circumference. The circumference is $3.14 \cdot 3 = 9.42$ feet. The poster's dimensions are 4 feet long and 9.42 feet wide, or 4 feet by 9.5 feet rounded to the nearest half foot.
- The surface of the trash cans without the top and bottom can be derived using part of the formula for a cylinder's surface area: $SA = \pi \cdot d \cdot h$. $3.14 \cdot 3 \cdot 4 = 37.68$ square feet or 38 square feet when rounded to the nearest square foot.

- Using the surface area formula for a rectangular prism, each CD has a surface area of: $2 \cdot (6 \cdot .25 + 6 \cdot 5 + .25 \cdot 5) = 65.5$ square inches. Multiply the surface area of 1 CD $\cdot 100$ to find the total amount of paper needed to wrap 100 CDs: $65.5 \cdot 100 = 6,550$ square inches of paper.
- The answer uses the surface area formula for a square pyramid but without the base area: $1/2 \cdot 40 \text{ feet} \cdot 10 \text{ feet} = 200$ square feet.

Bonus Worksheet 3: Turn Up the Volume!

- The volume of the room is 180,000 cubic feet, so the band can turn up their amplifiers 10 notches in this gym.
- First calculate the area of the gym floor: $60 \cdot 100 = 6,000$ square feet. If 1,200 people fit into 6,000 square feet, then one person occupies 5 square feet ($6,000 \div 1,200 = 5$). For 1,500 people: $1,500 \cdot 5 = 7,500$ square feet.
- In the formula for the volume of a rectangular prism ($V = l \cdot w \cdot h$), the $l \cdot w$ is actually the area of the floor, so you can say $V = \text{floor area} \cdot \text{height}$. Rearrange the formula to: $\text{Height} = \text{Volume} \div \text{floor area}$. $H = 280,000 \div 8,000 = 35$ feet.
- Using the formulas for the volume of a square pyramid and the area of a rectangle, students can find the length of one of the hologram's base sides: $6,250 = 1/3 \text{ BA} \cdot 30$, so $\text{BA} = 625$. Because $\text{BA} = l \cdot w$ and $25 \cdot 25 = 625$, one side of the pyramid's base is 25 feet.

Take-Home Worksheet Front Cover: Warm-Up

- area; 2. surface area; 3. volume; 4. cylinder; 5. cone

Take-Home Activity 1: Poster-Crazy

- Answers will vary
- Area of rectangular posters: $8.5 \cdot 11 = 93.5$. $93.5 \cdot 10 = 935$ square inches, or 6.5 square feet
Area of circular posters: $\pi \cdot 1^2 = 3.14$ square feet $\cdot 5 = 15.7$ square feet
Area of triangular poster: $1/2 \cdot (3 \cdot 3) = 4.5$ square feet
Total area of posters: 26.7 square feet

Now Try This: Answers will vary depending on the width of the doorway, which will determine the diameter of the welcome mats. Students need to measure the diameter and put their numbers in the formulas for circumference and area.

Take-Home Activity 2: Covering Up

- The student is painting 2 sides and a top each measuring 3 square feet, and the back measuring 9 square feet. $9 + 3 + 3 + 3 = 18$ square feet
- $(75 \cdot 54) + [2(75 \cdot 6)] + [2(54 \cdot 6)] = 4,050$ square inches + 900 square inches + 648 square inches = 5,598 square inches. 144 square inches = 1 square foot, so $5,598/144 = 38.875$ square feet, or 38 square feet and 126 square inches.

Now Try This: To figure out the area of the hat, use the formula $\pi \cdot r \cdot \text{slant } h$. $3.14 \cdot 2 \cdot 7 = 43.96$ square inches. If a 1-ounce jar covers 33 square inches, the student does not have enough paint for his or her hat.

Take-Home Activity 3: The Perfect Fit

- $6 \cdot 5 \cdot .25 = 7.5$ cubic inches; $7.5 \cdot 80 = 600$ cubic inches
- Answers will vary.
- $15^2 \cdot 3.14 \cdot 5 = 3,532.5$ cubic feet, or 26,423.1 gallons

Now Try This: $V = \pi \cdot r^2 \cdot h$, so $22 = 3.14 \cdot 1 \cdot h$. To get the answer for h , divide 22 by 3.14. $22 \div 3.14 = 7.006$. Rounded to the nearest inch the height is 7 inches.