

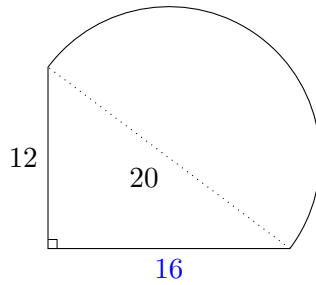
Math 123  
 Spring 2023  
 Dr. Lily Yen

# Quiz 3

Show all your work

Name: \_\_\_\_\_  
 Number: \_\_\_\_\_  
 Signature: \_\_\_\_\_  
 Score: \_\_\_\_/11

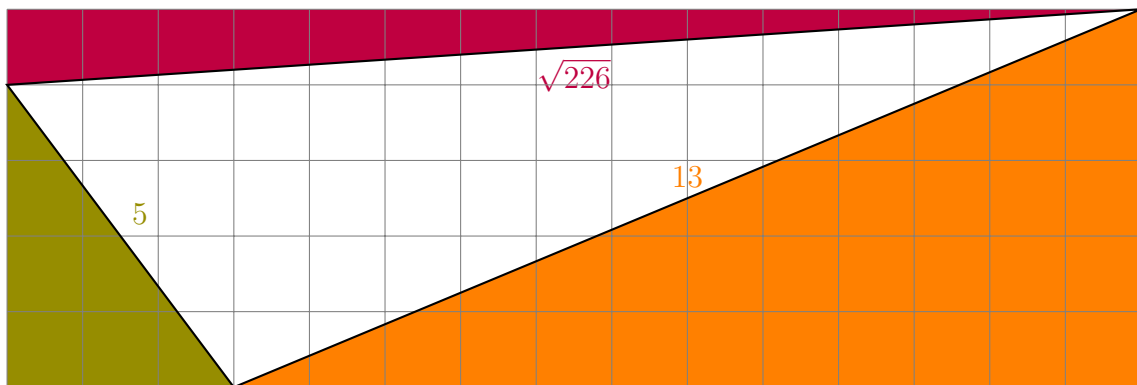
**Problem 1:** Find the combined area of a right triangle with a semicircle drawn on its hypotenuse. If necessary, round to nearest thousandths.



If the last side of the triangle has length  $x$ , the Pythagorean Theorem gives that  $x^2 + 12^2 = 20^2$ , so  $x^2 = 20^2 - 12^2 = 256 = 16^2$ , so  $x = 16$ .  
 Therefore the triangle has area  $\frac{16 \times 12}{2} = 96$ .  
 The semicircle has radius 10, so its area is  $\frac{1}{2}\pi r^2 = \frac{1}{2}\pi 10^2 = 50\pi$ .  
 The total area is then  $96 + 50\pi \approx 253.080$ .

Score: /3

**Problem 2:** Below is a  $5 \times 15$  grid containing a big triangle. Find the perimeter of the big triangle. Show your work for each side length.

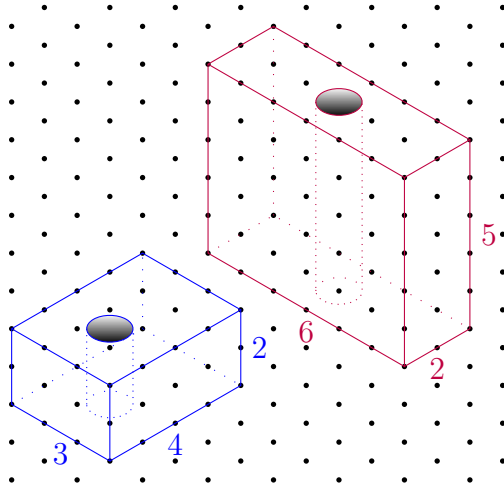


Using the Pythagorean Theorem, the hypotenuse of the top triangle is  $\sqrt{15^2 + 1^2} = \sqrt{226}$ , while the hypotenuse of the left triangle is  $\sqrt{3^2 + 4^2} = \sqrt{25} = 5$ , and the hypotenuse of the right triangle is  $\sqrt{12^2 + 5^2} = \sqrt{169} = 13$ .  
 The perimeter is therefore  $\sqrt{226} + 5 + 13 = 18 + \sqrt{226} \approx 33.03$ .

Score: /2

**Problem 3:** In the three dimensional guide below, draw a tall rectangular prism (a box) with base area 12 square units.

- Indicate the height of the rectangular prism on the 3-D grid.
- Drill a cylindrical hole of diameter 1 from the top to the bottom of the tall rectangular prism. Find the volume of the resulting solid.

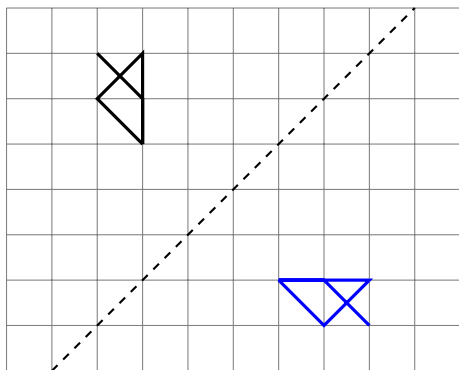


Many boxes are possible. For example, the base could be  $3 \times 4$  and the height 2. That yields a volume of  $3 \times 4 \times 2 - \pi(\frac{1}{2})^2 \times 2 = 24 - \frac{\pi}{2} \approx 22.43$ .  
 If the base is  $2 \times 6$  and the height is 5, the volume is  $2 \times 6 \times 5 - \pi(\frac{1}{2})^2 \times 5 = 60 - \frac{5}{4}\pi \approx 56.07$ .  
 If the base is  $1 \times 12$  and the height is 3 (not drawn), the volume is  $1 \times 12 \times 3 - \pi(\frac{1}{2})^2 \times 3 = 36 - \frac{3}{4}\pi \approx 33.64$ .

$$V = 12h - \frac{h}{4}\pi$$

Score: /4

**Problem 4:** Reflect the given figure along the dashed line.



Score: /2