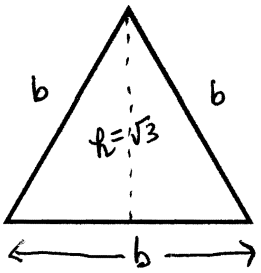
Math 213 Exam 3A Fall 2016 Name Answers

- You must show all work for each part of every question to receive full credit.
- Unless stated otherwise, you should use the approximation 3.14 for π.
- Unless stated otherwise, please round final answers to the nearest hundredth.

1(10). A wire is bent into the shape of an equilateral triangle. The area enclosed by the triangle is $\sqrt{3}$ cm^2 and the height of the triangle is $\sqrt{3}$ cm.

a. Find the perimeter of the triangle in centimeters. Show all work.



$A = \frac{1}{2} \cdot b \cdot h$

$\sqrt{3} = \frac{1}{2} \cdot b \cdot \sqrt{3}$

$1 = \frac{1}{2} b$

$2 = b \rightarrow$ Perimeter $= 2+2+2 = 6$ cm

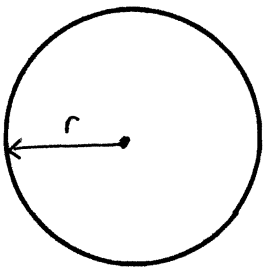
b. Express the answer to part a in millimeters. Use a sketch and the meaning of multiplication or the meaning of division to justify your answer.

There are 10 mm in every cm

so there are 6 groups of 10mm

or 60 mm //

2(5). A piece of wire 4 inches long is bent into a circle. Find the radius of the circle.

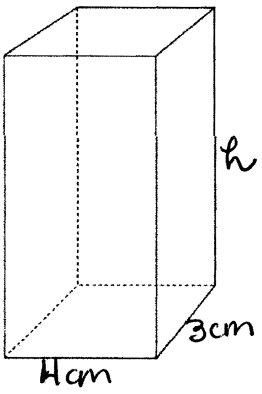


$C = 2\pi r$

$4 = 2\pi \cdot r$

$r = \frac{4}{2\pi} \approx .64$ inches

3(8). A certain rectangular prism has total surface area 94 cm^2. The width of its rectangular base is 3 cm, while the length is 4 cm. Find the height of the prism.



SA = Top + Bottom + Left + Right + Front + Back

$94 = 3 \cdot 4 + 3 \cdot 4 + 3h + 3h + 4h + 4h$

$94 = 24 + 14h$

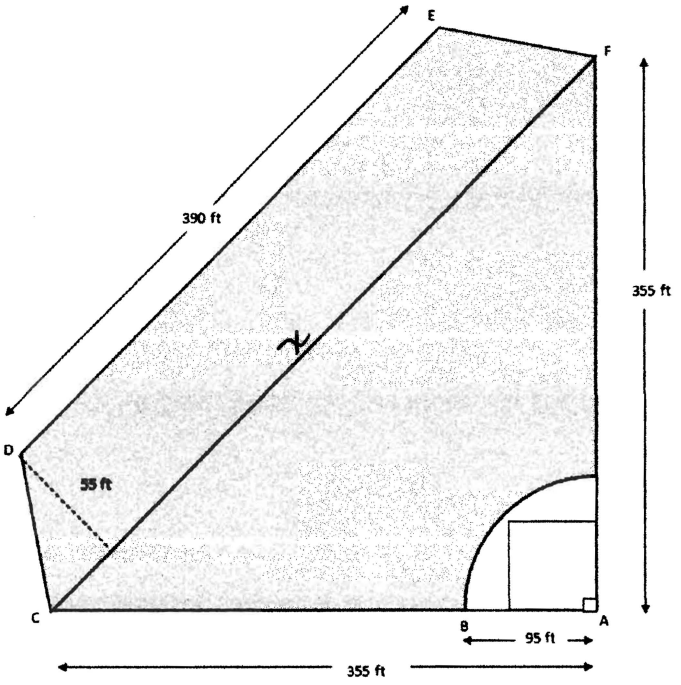
$\rightarrow h = 5$ cm

4(24). The new Superwoman Softball Stadium is to be built using the diagram at right.

ACF is an isosceles right triangle. AC = AF = 355 ft.

CDEF is an isosceles trapezoid with height 55 ft. and DE = 390 ft.

AB =95 ft, which is the radius of the unshaded quarter-circle; the center of the quarter-circle is A.



Find x (length of CF):

$355^2 + 355^2 = x^2$

$\rightarrow x \approx 502.05$ ft

a. The outfield is the shaded area above. Find the area of the outfield in square feet. Show all work.

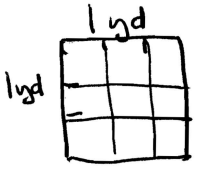
Δ area $= \frac{1}{2} \cdot 355 \cdot 355 = 63012.5$ ft^2

Quarter circle area $= \frac{1}{4} \cdot \pi \cdot 95^2 = 7084.625$ (Deduct this area)

Trapezoid area $= \frac{1}{2}(390 + x)(55) \approx \frac{1}{2}(390 + 502.05)(55) = 24531.375$

Shaded area $= 80,459.25$ ft^2

b. Convert the area found in part a to square yards. Show work, including a diagram to help explain the relationship between square feet and square yards.



there are 9 ft^2 in each yd^2

$80,459.25 \text{ ft}^2 \times \frac{1 \text{ yd}^2}{9 \text{ ft}^2} = 8939.92 \text{ yd}^2$

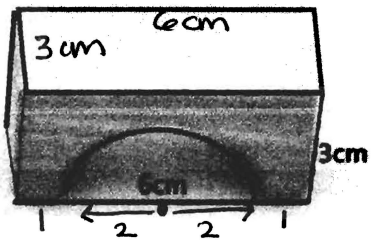
c. The outfield is to be seeded with Bermuda grass. If each bag of seed covers 1500 square yards, how many bags of seed will be needed? Show work.

$\frac{8939.92}{1500} \approx 6$ bags $\quad (5.96 \rightarrow 6)$

5(25). Consider the child's building block shown at right.

Assume the overall dimensions of the block are 6 cm by 3 cm by 3 cm.

Assume the curved cut-out portion is a half-cylinder with radius 2 cm.



a. Find the entire surface area of this block. (Note: There are a total of 8 faces). Include appropriate units. Show all work.

SA = Top + Bottom left + Bottom right + Left + Right + Front + Back + Curve

$3 \cdot 6 + 3 \cdot 1 + 3 \cdot 1 + 3 \cdot 3 + 3 \cdot 3 + \underbrace{11.72}_{\text{see } *} + 11.72 + \underbrace{18.84}_{\text{see } **}$

Total SA = $84.28\ cm^2$

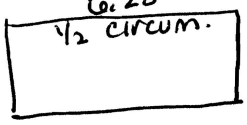
* Rectangle − semicircle

$= 6 \cdot 3 - \frac{1}{2} \cdot \pi \cdot 2^2$

$= 18 - 6.28$

≈ 11.72

** Curve = rectangle (if "unwrapped" and laid flat)



Circum $= 2\pi r = 2\pi \cdot 2$

$\frac{1}{2}$ circum $= \pi \cdot 2 \approx 6.28$

$\rightarrow$ Area ≈ 18.84

b. Find the volume of this block. Include appropriate units.

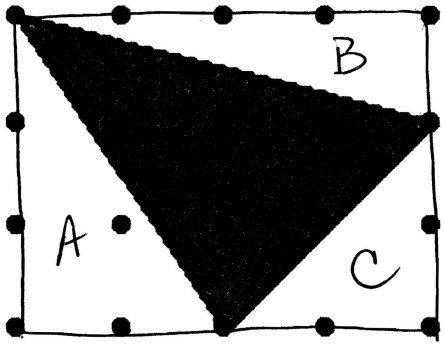
$V = A \cdot h$ Base is ⊓ (front) with area 11.72 (see above)

$= 11.72(3) = 35.16\ cm^3$

c. Convert the volume of the block to cubic inches. Use the fact that 2.54 cm = 1 inch (as linear measures) in your calculation.

$$35.16\ cm^3 \times \frac{1\ in^3}{(2.54)^3\ cm^3} \approx 2.15\ in^3$$

6(8). Find the area of the lattice polygon below. Annotate the diagram so your way of thinking is clear.

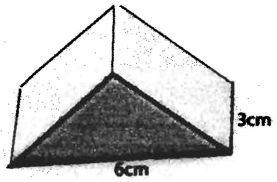


Outer rectangle = $4 \cdot 3 = 12$ sq units
Subtract region A = $\frac{1}{2}(3 \cdot 2) = 3$
Subtract region B = $\frac{1}{2}(4 \cdot 1) = 2$ } 7
Subtract region C = $\frac{1}{2}(2 \cdot 2) = 2$

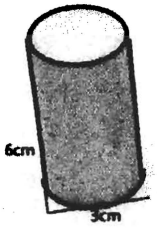
$\Rightarrow$ Shaded area = $12 - 7 = 5$ sq units //

7(20). Consider the shapes below.

A

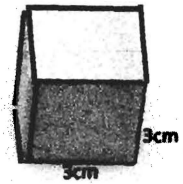


B

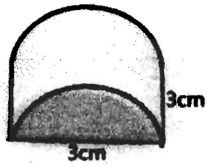


C

D (all faces are squares)



E



a. Which of the shapes above are polyhedra? A, D

b. Which of the shapes above are prisms? A, D

c. Which of the shapes above are convex? A, B, D, E

d. Which of the shapes above are Platonic solids? D