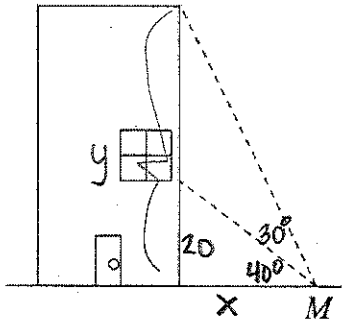
Geometry Final Review 2014
Name: Key

1. A building stands on level ground. At a point M on the ground, the angle of elevation to the second floor windowsill, which is 20' above the ground, is 40°. From point M, the angle of elevation to the top of the building is 70°. Find the height of the building.

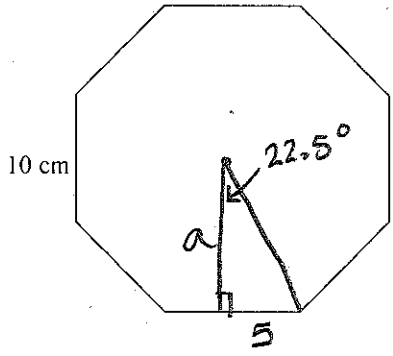


$\tan 40 = \frac{20}{x}$ $\tan 70 = \frac{y}{23.835}$

$x \approx 23.835$

$y = 65.486$ ft

2. Find the area of the regular octagon to the right.
SHOW YOUR STEPS!



$\tan 22.5 = \frac{5}{a}$

$a \approx 12.07$

$A = \frac{1}{2}(12.07)(80)$

$A = 482.84\ cm^2$

3. The diameter of a wheel on Derrick's car is 28 inches.

$d = 28$
$r = 14$

a. How far along the ground does the wheel travel after one complete rotation? Draw a diagram and show your work.

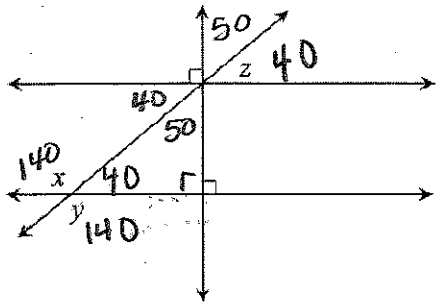
$C = \pi d$

$C = 28\pi$ in ≈ 87.96 in

b. If the wheel rolls 140π inches, how many rotations did it complete? Show your work.

$\frac{140\pi}{28\pi} =$ 5 rotations

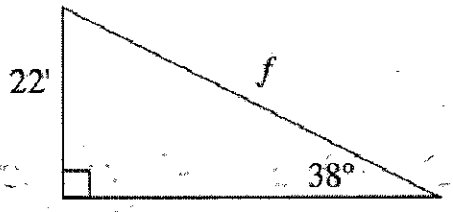
4. Four lines intersect as shown in the figure at right. If $z = 40°$ what is the value of $x + y$?



280°

5. For each diagram below, solve for the variable(s).

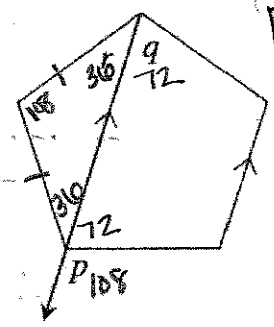
a.



$\sin 38 = \frac{22}{f}$

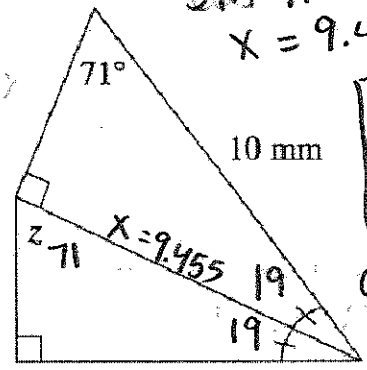
$f \approx 35.73$ in

b. a regular pentagon



$P = 108$
$q = 72$
$r = 36$

c.



$\sin 71 = \frac{x}{10}$

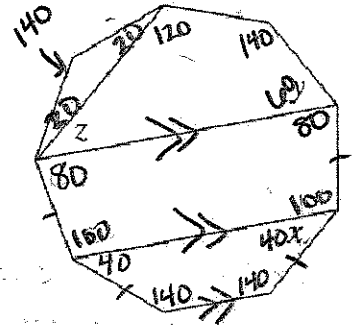
$x = 9.455$

$z = 71°$

$h = 3.08$ mm

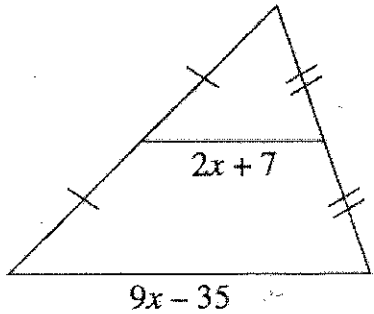
$\cos 71 = \frac{h}{9.455}$

d. a regular nonagon



$x = 40$
$y = 60$
$z = 40$

e.



$\frac{1}{2} = \frac{2x+7}{9x-35}$

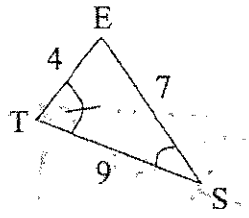
$4x + 14 = 9x - 35$

$14 = 5x - 35$

$49 = 5x$

$x = 9.8$

6. Consider the two triangles shown at right.

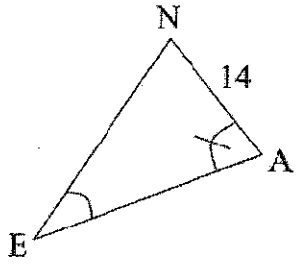


a. Are the triangles similar? Explain completely.

Yes, ~ by AA.

b. Calculate the perimeter of ΔTES.

4+7+9 = 20 units



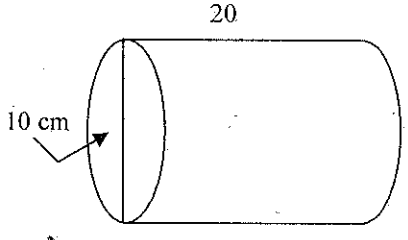
c. Aaron was trying to find the perimeter of ΔANE, but thought it was not possible since two sides are unknown. He decided to try something, and he wrote

$$\frac{4}{14} = \frac{20}{P}$$

and he solved for P. What did Aaron do? Will this work? Explain completely. He set up a proportion comparing corresponding sides to the perimeters. Yes, it will work.

7. Calculate the volume and surface area of each figure shown below.

a.



$V = \pi(5^2)(20)$

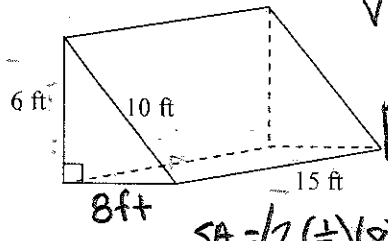
$V = 500\pi\ cm^3$

$SA = 2(\pi(5^2)) + 10\pi(20)$

$= 50\pi + 200\pi$

$SA = 250\pi\ cm^2$

b.



$V = \left(\frac{1}{2}(8)(6)\right)15$

$= 24(15)$

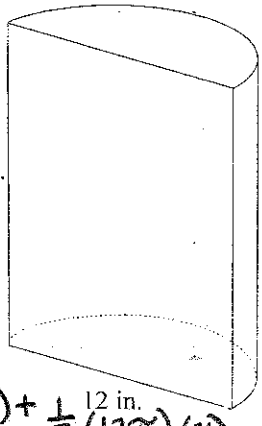
$V = 360\ ft^3$

$SA = \left(2\left(\frac{1}{2}\right)(8)(6)\right) + 10(15) + 6(15) + 6(8)$

$= 48 + 150 + 90 + 48$

$SA = 336\ ft^2$

c.



$V = \frac{1}{2}(\pi 6^2)8$

$= \frac{1}{2}(288\pi)$

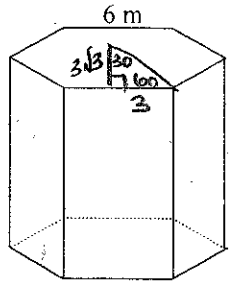
$V = 144\pi\ in^3$

$SA = 2\left(\frac{1}{2}\right)(\pi 6^2) + 8(12) + \frac{1}{2}(12\pi)(8)$

$= 36\pi + 96 + 48\pi$

$SA = 84\pi + 96\ in^2 \approx 360\ in^2$

d.



$V = \left(\frac{1}{2}(3\sqrt{3})(36)\right)8$

$= 54\sqrt{3}(8)$

$V = 432\sqrt{3}\ m^3 \approx 748.2\ m^3$

$SA = 2\left(\frac{1}{2}(3\sqrt{3})(36)\right) + 6(6)(8)$

$SA = 108\sqrt{3} + 288\ m^2 \approx 475.1\ m^2$

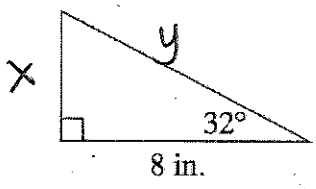
8. Multiple Choice: Given $M(-2, 3)$ is the midpoint of $\overline{AB}$ where $A(5, -1)$ then the coordinates of B are:

A. $B(3, 2)$
B. $B(1.5, 1)$
C. $B(12, -7)$
D. $B(-9, 7)$
E. None of these

$\left(\frac{5+x}{2} = -2, \frac{-1+y}{2} = 3\right)$

$x = -9$ $\quad y = 7$

9. Find the perimeter of the triangle.

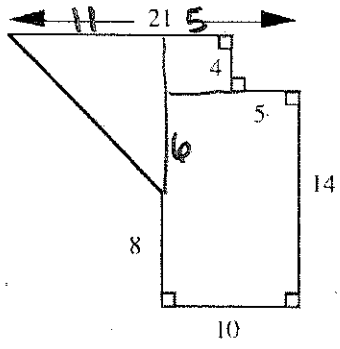


$\tan 32 = \frac{x}{8}$ $\quad \cos 32 = \frac{8}{y}$

$x = 5$ in $\quad y = 9.43$

$P = 8 + 5 + 9.43 = 22.43$ in

10. Find the area of this figure. Show your dissections and any sub problems you use.

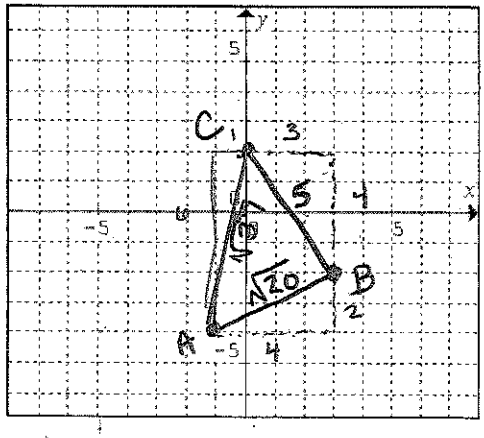


$10(14) + 4(5) + \frac{1}{2}(11)(10)$

$140 + 20 + 55$

$A = 215\ u^2$

11. Find the area and perimeter of the triangle formed by the points $A(-1, -4)$; $B(3, -2)$, $C(0, 2)$



$AB = \sqrt{20} = 2\sqrt{5}$
$BC = 5$
$AC = \sqrt{37}$

$P = 5 + 2\sqrt{5} + \sqrt{37}$
≈ 15.55 units

$A = 4(6) - 6 - 3 - 4$
$= 24 - 13$
$A = 11\ u^2$

12. Find the following ratios for two **similar** figures.

a. If the side ratio is 5:13, then the area ratio is 25:169. $5^2:13^2$

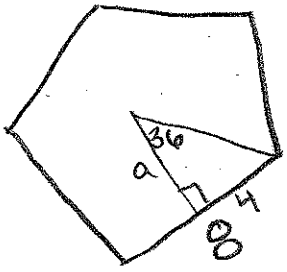
b. If the volume ratio is 729:1728, then the side ratio is 9:12. $\sqrt[3]{729}:\sqrt[3]{1728}$

c. If the area ratio is 36:49, then the volume ratio is 216:343

↓ ↓

6:7 $6^3:7^3$

13. Mrs. Herlihy has discovered her green thumb! She is going to plant a pentagonal garden in her backyard. Each side length of her garden will be 8 feet. She is going to purchase compost to help fertilize her garden. How much area does she have to cover with compost?



$\tan 36 = \frac{4}{a}$

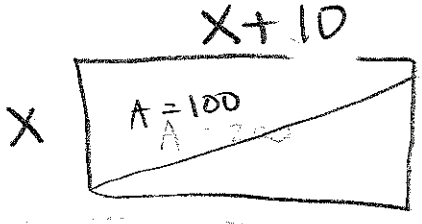
$a = 5.5$

$A = \frac{1}{2}(5.5)(40)$

$A = 110.11 \text{ ft}^2$

14. A rectangle has a length that is ~~6~~ 10 more than the width. If the area is 200 cm^2, what is the length of the diagonal?

1200
100
4, 50
1
5, 40
8, 25
0, 120



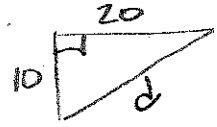
diag = 20.62

$100 = \frac{1}{2}(x)(x+10)$

$100 = \frac{1}{2}(x^2+10x)$

$200 = x^2+10x$

$x^2+10x-200 = 0$



$d^2 = 10^2+20^2$

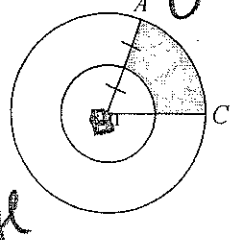
$d^2 = 100+400$

$d = \sqrt{500} \approx 22.3$

$0 = (x+20)(x-10)$

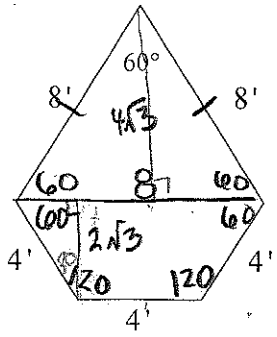
$x = -20 \quad x = 10$

15. What percentage of sector *ABC* is shaded? Justify your answer completely.



75%. The area of the outside circle is 4 times as large as the inside area. The shaded region is 3/4 of the whole region.

16. Find the area of the shape at right.

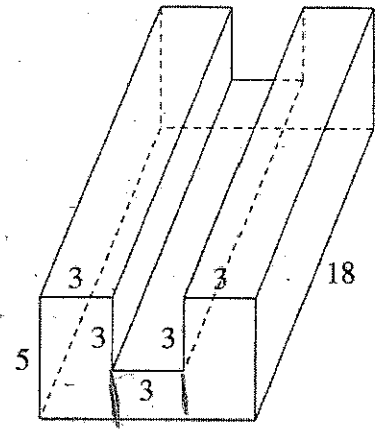


$A = \left(\frac{1}{2}(8)(4\sqrt{3})\right) + \frac{1}{2}(8+4)(2\sqrt{3})$

$= 16\sqrt{3} + 12\sqrt{3}$

$A = 28\sqrt{3}\ ft^2 \approx 48.5\ ft^2$

17. Calculate the total surface area and volume of this figure. Show all sub problems.



$V = (5(3))18 + (3(2))18 + (5(3))18$

$= 270 + 108 + 270$

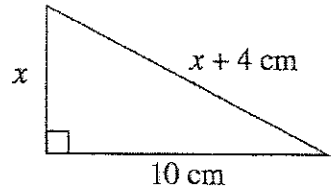
$V = 648\ u^3$

$SA = 2(5\cdot3) + 2(3\cdot2) + 2(5\cdot3) + 9(18) + 2(5\cdot18) + 5(3\cdot18) +$

$= 30 + 12 + 30 + 162 + 180 + 270$

$SA = 684\ u^2$

18. Find the perimeter of the triangle.



$x^2 + 10^2 = (x+4)^2$

$x^2 + 100 = x^2 + 8x + 16$

$100 = 8x + 16$

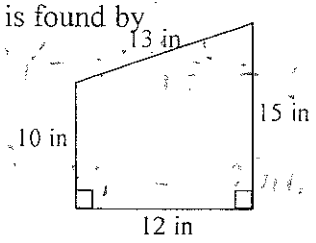
$84 = 8x$

$x = 10.5$

$P = 10.5 + 10 + 14.5$

$P = 35\ cm$

19. Multiple Choice: The area of the trapezoid shown to the right is found by



A. $\frac{1}{2}(12+13)(10)$

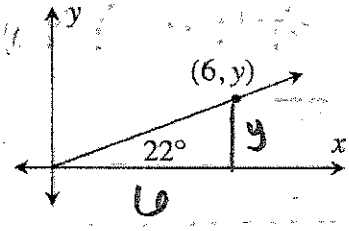
B. $\frac{1}{2}(12+13)(15)$

C. $\frac{1}{2}(10+15)(12)$

D. $\frac{1}{2}(10+15)(13)$

E. None of These

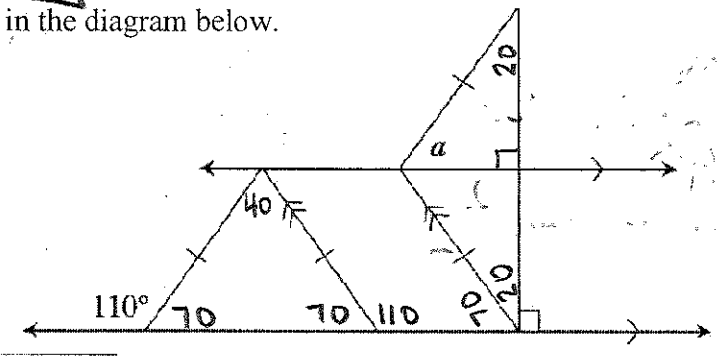
20. The line to the right goes through the point $(6, y)$. If the angle the graph makes with the x-axis is $22°$, what is the y-coordinate of the point?



$\tan(22) = \frac{y}{6}$

$y = 2.42$

21. Find the measure of angle a in the diagram below.



$a = 70°$

22. A cone and cylinder both have a base radius of r and a height of $2r$. A sphere has a radius of r. Compare the volumes of all three solids. What do you notice? Be clear.

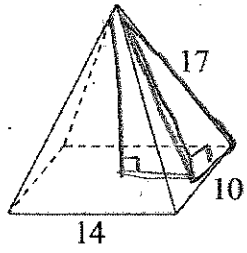
$V_{cone} = \frac{1}{3}(\pi r^2)(2r) = \frac{2}{3}\pi r^3$

$V_{cylinder} = \pi r^2(2r) = 2\pi r^3$

$V_{sphere} = \frac{4}{3}\pi r^3$

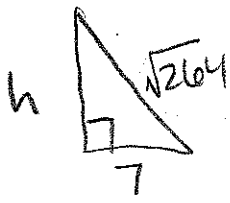
The volume of the cone plus the sphere equals the volume of the cylinder.

23. Calculate the volume of the right rectangular pyramid at right.



$V = \frac{1}{3}(14(10)\sqrt{215})$

$V = 684.23\ u^3$



$h^2 + 7^2 = \sqrt{264}^2$

$h^2 + 49 = 264$

$h^2 = 215$

$l^2 + 5^2 = 17^2$

$l = \sqrt{264}$

24. Find the shaded area.