SOLUTIONS:

1. $4s = s^2$
$s = 4$

2. $d = 12$
$r = 6$
$V = \frac{4\pi(6)^3}{3}$
$V = 288\pi$

3. $A =$
$apothem = 4\sqrt{3}$
$perimeter = 48$
$A = \frac{1}{2}\left(4\sqrt{3}\right)(48)$
$A = 96\sqrt{3}$

4. $A = 40 \cdot 30 = 1200$

5. $\frac{100}{360} = \frac{x}{64\pi}$
$\frac{5}{18} = \frac{x}{64\pi}$
$320\pi = 18x$
$\frac{160\pi}{9} = x$

6. $\frac{4}{3}\pi r^3 = 288\pi$
$4\pi r^3 = 864\pi$
$r^3 = 218$
$r = 6$
$4\pi r^2 = 144\pi$

7. $A = lw$
$(.8l)(xw) = lw$
$(.8)x = 1$
$x = 1.25$

The width would have to increase by 25%.

8. 2 eggs per 10 pancakes
5 x 300 = 1500 pancakes per week
$\frac{1500}{10}$g2 = 300 eggs needed per week

9. $30 \cdot 20 = 600\,\text{ft}^2$

10. Diagonal of face = 4
Side of face = $2\sqrt{2}$
$V = \left(2\sqrt{2}\right)^3 = 16\sqrt{2}$

11. Diagonal of cube = 12
$12^2 = s^2 + \left(s\sqrt{2}\right)^2$
$144 = s^2 + 2s^2$
$144 = 3s^2$
$SA = 6s^2$
$SA = 2 \cdot 3s^2 = 2 \cdot 144$
$SA = 288$

$SA = 400\pi = 4\pi r^2$

$100 = r^2$

12. $10 = r$

$V = \frac{4}{3}\pi(10)^3$

$V = \frac{4000\pi}{3}$

13. Trapezoid is isosceles. By dropping the height and creating right triangles with hypotenuse = 10

leg = $\frac{(28-12)}{2} = \frac{16}{2} = 8$

you see the height must be 6. Thus,

$A = \frac{6}{2}(12+28)$

$A = 3(40)$

$A = 120$

14. Convert 1' height to 12"

$SA = 2\pi r^2 + 2\pi rh$

$SA = 32\pi + 96\pi$

$SA = 128\pi$

15. Note the plane creates similar triangles by looking at both heights so the radius of the top of the frustum is 5" thus the volume is

$V = \frac{\pi h}{3}\left(r_1^2 + r_2^2 + r_1 r_2\right)$

$V = \frac{5\pi}{3}\left(5^2 + 10^2 + (5\cdot 10)\right)$

$V = \frac{5\pi}{3}(175)$

$V = \frac{875\pi}{3}$

16. By looking at the points, you can see there is a base of length 6 between the points (2,3) and (2,9). The height from that base to point (6,6) is 4 since the line from (2,3) through (2,9) is vertical with no slope. So area is $\frac{6\cdot 4}{2} = 12$.

17. $SA = \pi l$ where $l =$ slant height. Find the slant height by finding the hypotenuse of the right triangle with radius of the opening as one leg and the height of the cone as the other. Legs: 1 and 7. Hypotenuse (slant height) = $5\sqrt{2}$.

$SA = \frac{2\pi \cdot 5\sqrt{2}}{2}$

$SA = 5\pi\sqrt{2}$

18. Find the radius of the sphere by finding the distance from (0,0) to $3x+4y=15$.

$$d=\frac{\left|3(0)+4(0)-15\right|}{\sqrt{3^2+4^2}}$$
$$d=\frac{15}{5} \qquad \text{so } r=3$$
$$d=3$$

$$V=\frac{4\pi 3^3}{3}=36\pi$$

19. Cube : $s=\sqrt[3]{512}=8$

Sphere $r=4$

$$V=\frac{4\pi 4^3}{3}$$
$$V=\frac{256\pi}{3}$$

20.
$$SA=2(lw)+2(lh)+2(wh)$$
$$840=2(16w)+2(160)+2(10w)$$
$$840=32w+320+20w$$
$$520=52w$$
$$10=w$$

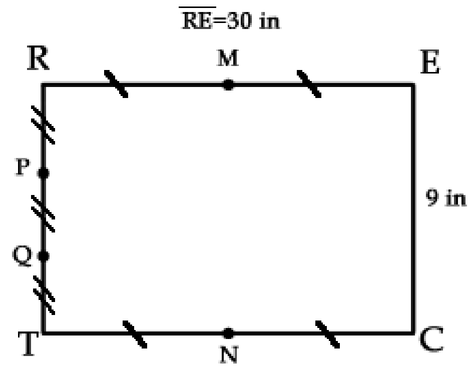
$$V=(16)(10)(10)$$
$$V=1600$$

21. 2a=4 and 2b=2

a=2 and b=1

$$A=\pi ab$$
$$A=2\pi$$

22.



ΔROQ with O being any point on $\overline{MN}$

Base of triangle = 6in

Height = 15in

$$A=\frac{15\cdot 6}{2}=45$$

23. Let S_1 have a side of s and thus an area of s^2. Then S_2 has a side of $\frac{s\sqrt{2}}{2}$ and an area of $\frac{s^2}{2}$. S_3 has a side of $\frac{s}{2}$ and an area of $\frac{s^2}{4}$. So on and so forth. So the area of square $S_n=\frac{s^2}{2^{n-1}}$. Thus the area of $S_{10}=\frac{s^2}{2^9}=\frac{s^2}{512}$ which makes the area of $S_{10}=\frac{1}{512}$th the area of S_1.

24. Both rotations will make cylinders. The y-axis rotation will have a radius of 6 and a height of 3 while the x-axis rotations will have a radius of 3 and a height of 6. So:

$$SA_y = 2\pi(6)^2 + (12\pi)3$$
$$SA_y = 72\pi + 36\pi$$
$$SA_y = 108\pi$$

$$SA_x = 2\pi(3)^2 + (6\pi)6$$
$$SA_x = 18\pi + 36\pi$$
$$SA_x = 54\pi$$

$$108\pi - 54\pi = 54\pi$$

25. The triangle has legs of 8 and 15 and thus an area of 60. Then the area of the square must be 240 and the side of the square must be $\sqrt{240} = 4\sqrt{15}$ which means the diagonal of the square is $4\sqrt{30}$

26. Since the area of the base is 120 ft^2 then with water pumping at 10ft^3/minute it would take 12 minutes for the water to rise 1'. Thus the water is rising at a rate of 1"/min.

27.

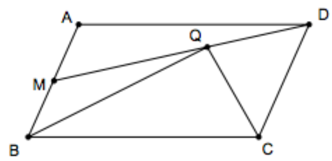
$$\text{Batter} = \frac{500\left(\pi(2.5)^2\right)}{4} = 125\pi(6.25) = 781.25\pi$$

28.

$$A = 2(40\cdot 9) + 2(20\cdot 9)$$
$$A = 720 + 360$$
$$A = 1080$$

Paint $= \dfrac{1080}{100} = 10.8$ so she needs 11 cans of paint.

29.



Since M is the midpoint of $\overline{AB}$ we can tell that ΔADM has an area that is $\frac{1}{4}$ of the area of the parallelogram. This means the area of $MDBC$ is $\frac{3}{4}$ of that area. Then by knowing the areas of ΔMQB and ΔDCQ are both 60 and the bases are 6 and 12 respectively then the corresponding heights must be 20 and 10. Thus, the total height of the parallelogram from base $\overline{AB}$ is 30. That means the area of the parallelogram is $A = 12\cdot 30 = 360$ which means the area of $MDBC = \frac{3}{4}(360) = 270$ and then area of $\Delta QBC = 270 - 60 - 60 = 150$.

30. To find the depth of the liquid you add the radius and the height of the triangle created by the chord and the 2 radii from the vertices of the chord to the center of the circle. That triangle has 2 sides of length 6 and a base of $6\sqrt{3}$. Because it's isosceles, dropping the height will divide it into 2 congruent right triangles with hypotenuse of 6 and leg of $3\sqrt{3}$. Thus the height of the triangle is 3 and that means the depth of the liquid in the truck $3+6=9$.

TIEBREAKER:
Find the area of the outer red ring and the inner red circle and add them together. Outer ring area is found by finding the area of the largest "circle" $\begin{array}{l} A=\pi(12.5)^2 \\ A=156.25\pi \end{array}$ and subtracting the area of the circle created by the outer edge of the white ring $\begin{array}{l} A=\pi(7.5)^2 \\ A=56.25\pi \end{array}$ which gives you $156.25\pi-56.25\pi=100\pi$.
Inner red circle has an area of $\begin{array}{l} A=\pi(2.5)^2 \\ A=6.25\pi \end{array}$.
So the amount of red paint needed is $100\pi+6.25\pi=106.25\pi$ ft^2.