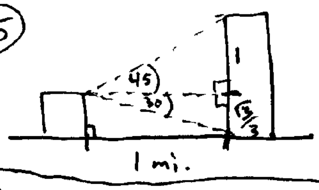
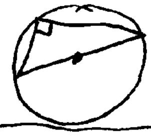
(15)



$1+\frac{\sqrt{3}}{3}$

$\boxed{D}$

(16)



$\boxed{A}$

(17)

	1 1	
2	2 3	3
15	5 8	16
8	1 1	5
25		24

$\frac{25-24}{2} = \frac{1}{2}$.

$\boxed{B}$

(18) $c = \sqrt{(d+e)e}$.

$\boxed{C}$

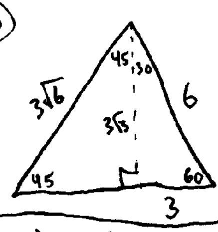
(19) Let BC = X. Using the properties of 45-45-90 triangles, we can work our way around the figure and find

$AC = X(\sqrt{2})^8 = 16X$.

So, $AB = 16x - x = 15x = 30$

$X = 2$. $\boxed{A}$

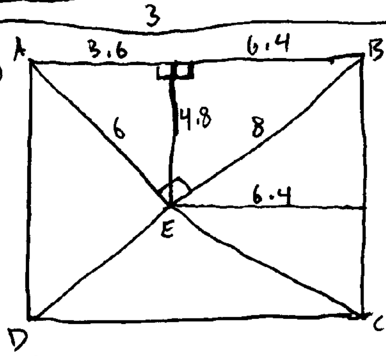
(20)



$3\sqrt{6}$

$\boxed{C}$

(21)



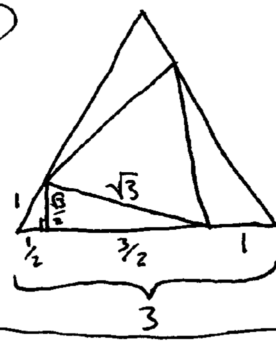
Area of $\triangle BCE = \frac{1}{2}(BC)(6.4)$

$16 = \frac{1}{2} BC \cdot 6.4$

$BC = 5$

$(BC)(AB) = 5 \cdot 10 = 50$. $\boxed{A}$

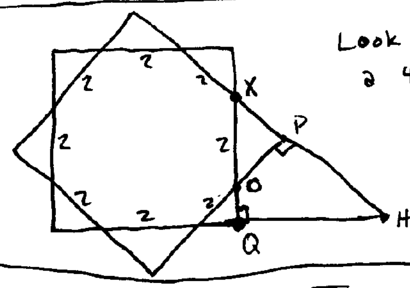
(22)



$\text{Area} = \frac{3^2\sqrt{3}}{4} = \frac{9\sqrt{3}}{4}$. $\boxed{B}$

(23) Each small triangle has equal area and equal height, so they must all also have equal bases: 4. $\boxed{D}$

(24)



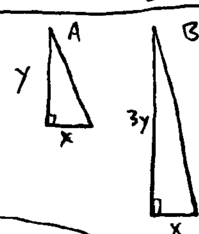
Look at triangle XQH. It is a 45-45-90 triangle with leg $XQ = 2+\sqrt{2}$. Area of $XQH = 3+2\sqrt{2}$.

Area of QOPH = Area of XQH − Area of XPO =

$3+2\sqrt{2} - 1 = 2+2\sqrt{2}$. $\boxed{A}$

(25) $UX = \frac{1}{2} SQ = \frac{\sqrt{41}}{2}$. $\boxed{D}$

(26)

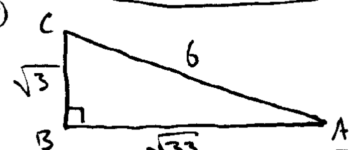


Area of A = $\frac{1}{2}xy$

Area of B = $\frac{1}{2}3xy$

ratio = $\frac{\frac{1}{2}xy}{\frac{1}{2}3xy} = \frac{1}{3}$ $\boxed{B}$

(27)



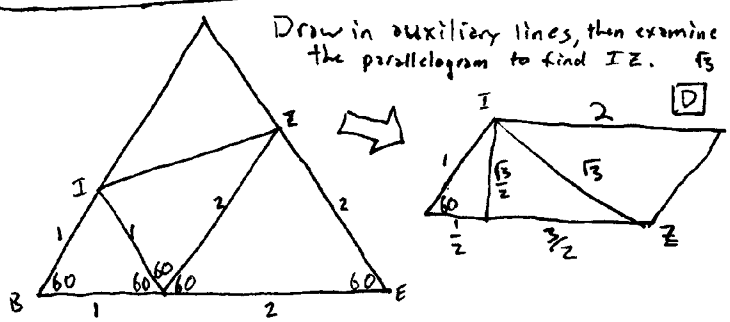
$(\sin A)^2 + (\cos A)^2 =$

$\left(\frac{\sqrt{3}}{6}\right)^2 + \left(\frac{\sqrt{33}}{6}\right)^2 = 1$. $\boxed{B}$

(28)

Draw in auxiliary lines, then examine the parallelogram to find IZ. $\sqrt{3}$

$\boxed{D}$

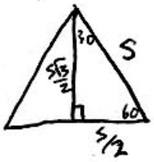


(29) $\frac{AB}{BD} = \frac{AC}{CD}$, so AD must be an angle bisector. 1:1. $\boxed{E}$

(30) 4 is too short, 24 is too long, 14 is just right.

$\boxed{B}$

TRIANGLES THETA State 2004 Solutions

1) 

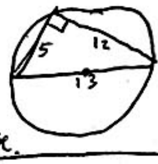
$A=\frac{1}{2}bh$

$=\frac{1}{2}s\cdot\frac{s\sqrt3}{2}=\frac{s^2\sqrt3}{4}$.

$\boxed{C}$

2) $R=\frac{abc}{4A}=\frac{5\cdot12\cdot13}{4\cdot(30)}=6.5$ $\boxed{B}$

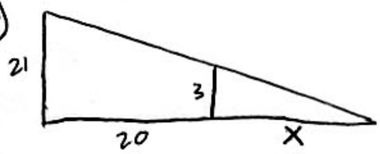
Or, note that since the triangle is right, the radius is half the hypotenuse.



3) $A=\frac{P}{2}\cdot r$ $r=4.$ $A=12$

$12=\frac{P}{2}\cdot4$

$P=6.$ $\boxed{A}$

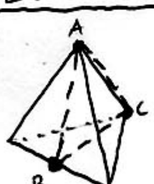
4) 

$\frac{x}{3}=\frac{x+20}{21}$. $x=\frac{10}{3}$ $\boxed{C}$

5) Total lengths $=L=(2+\sqrt2)+\frac{1}{2}(2+\sqrt2)+\frac{1}{4}(2+\sqrt2)+\ldots$

$2L=2(2+\sqrt2)+(2+\sqrt2)+\frac{1}{2}(2+\sqrt2)+\ldots$

$L=2L-L=2(2+\sqrt2)=4+2\sqrt2.$ $\boxed{C}$

6) 

ΔABC is the cross section.
$AB=CB$, but AC is not. [$AC=$ one edge of the tetrahedron. $AB=CB=\left(\frac{\sqrt3}{2}\right)\cdot AC$.]
$\therefore$ Isosceles only. $\boxed{B}$

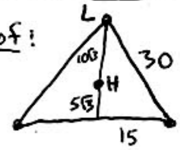
7) 3-4-5
5-12-13. These are the only ones. [After 12 and 13, the difference of any 2 consecutive squares is greater than 5^2.] $\boxed{B}$

8) $\left(\frac{-5+4+7}{3},\frac{0+1+2}{3}\right)=(2,1)$.

$\boxed{D}$

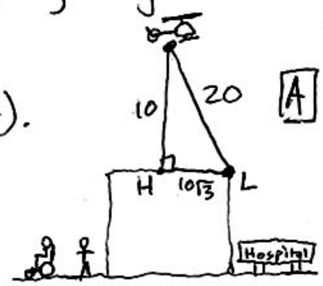
9) Definitions. $\boxed{D}$

10) The roof!



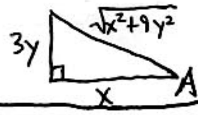
L = signal light.

H = spot helicopter is above, (also the center of the roof).

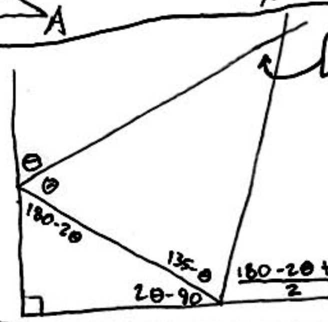


$\boxed{A}$

11) No triangle can be more than one of the following: right, acute, obtuse.
So, choose: one right,
one obtuse-scalene, and
one equilateral-isosceles-acute.
This makes 3 triangles. $\boxed{B}$

12) 

$\tan A=\frac{3y}{x}$. $\boxed{B}$

13) 

$\frac{180-2\theta+90}{2}=135-\theta$

$[180-(\theta+135-\theta)]$
$=180-135$
$=45$ $\boxed{A}$

14) Max Pieces using n-cuts:
$M_n=M_{n-1}+n.$
$M_4=11.$
# of triangles:
$T_n=n-2$ for $n\geq2$.
(with each new cut, every existing triangle becomes a quadrilateral and a smaller triangle, and one new triangle is made as well. This can be seen by drawing the correct cuts in order and counting the number of triangles each time.)
$T_4=4-2=2.$ $\boxed{B}$