1. $-105\sqrt{3}+19016$ **A** $-105\sqrt{3}$ $\frac{7!}{4!3!}x^4\left(-\sqrt{3}\right)^3$

B 8 $3+\sqrt{3x+1}=x$, move the 3 over, square both sides gives $3x+1=x^2-6x+9$, solving gives $\{1,8\}$ reject the 1

C 19008 To find how many numbers are in the sequence, $275=13+(n-1)2, n=132$.

To find the sum, $S_{132}=\frac{132}{2}(13+275); S_{132=19008}$

$A+B+C=-105\sqrt{3}+19016$

2. $11xy$ **A** $\frac{1}{2}$ After substituting $\frac{x+1}{x-1}$ for x in the other expression we have

$$\frac{\frac{x+1}{x-1}+1}{\frac{x+1}{x-1}-1}=\frac{\frac{x+1+x-1}{x-1}}{\frac{x+1-x+1}{x-1}}=\frac{2x}{2}=x,$$

substituting $\frac{1}{2}$ for x gives $\frac{1}{2}$

B 11 Substituting the coordinates in the equation for x and y, we get the two equations $a-b=1$ and $-5a+b=-25$. Solving this system gives $a=6$ and $b=5$. The sum of $a+b=11$.

C $2xy$ $\frac{x^3 \bullet 2y^2}{yx^2}=2xy$

$A \bullet B \bullet C=\frac{1}{2}\bullet 11 \bullet 2xy=11xy$.

3. $\frac{1}{16}$ **A** $\frac{15}{16}$ The probability of at least one head is the probability of all not tails.

Prob of all not tails is $1-P$ (all tails) = $1-\frac{1}{16}=\frac{15}{16}$

B 35 ${}_7C_3=35$

C $\frac{7}{3}$ P(no rain) $=\frac{7}{10}$ so odds of no rain is $\frac{7}{3}$

$$\frac{A\bullet C}{B}=\frac{\frac{7}{3}}{35}\bullet\frac{15}{16}=\frac{1}{16}$$

4. $\frac{9}{2}$

A 1 $\frac{x}{x+6}+\frac{2x+3}{2x^2+12x}=\frac{1}{x-1}$, Multiply each term in the equation by $2x(x+6)(x-1)$. This gives the equation $2x^2(x-1)+(2x+3)(x-1)=2x(x+6)$. Solve this and find the solutions are $3,\frac{-2\pm\sqrt{2}}{2}$. The sum of these is 1.

B $\frac{9}{2}$ Let $u=\frac{1}{x}$ and $v=\frac{1}{y}$. Substitute and this gives the system

$\begin{cases}\frac{u}{4}+\frac{7v}{2}=\frac{5}{4}\\ \frac{u}{2}-3v=-\frac{5}{14}\end{cases}$. Solving this system gives $v=\frac{2}{7},u=1$. So $x=1,y=\frac{7}{2}$,sum is $\frac{9}{2}$.

$A\bullet B=1\bullet\frac{9}{2}=\frac{9}{2}$.

5. 61

A 1 $\left(\log\left(5\log(100)\right)\right)^2=\left(\log(5\bullet 2)\right)^2=1$

B 25 $9^{\log_3 5}=3^{2\log_3 5}=3^{\log_3 25}=25$

C 4 $256^{0.16}\bullet 256^{0.09}=256^{\frac{1}{4}}=4$

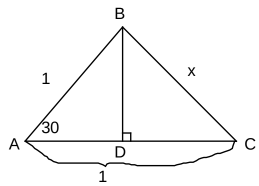
D 144 $\frac{x^{\frac{1}{2}}}{4}=12, x=144$

$\frac{D}{C}+AB=\frac{144}{4}+1\bullet 25=36+25=61$

6. $\frac{2-\sqrt{3}}{344}$

R $2-\sqrt{3}$ Using the diagram, $AD=\frac{1}{2}\sqrt{3}$ which makes $DC=1-\frac{1}{2}\sqrt{3}$ and $BD=\frac{1}{2}$.

Use the Pythagorean Theorem in triangle BCD. This gives



$$\left(\frac{1}{2}\right)^2+\left(1-\frac{1}{2}\sqrt{3}\right)^2=x^2.$$

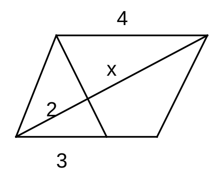
$$x^2=2-\sqrt{3}$$

S 129 $y=-2x^2+8x-5$, $y=-2(x-2)^2+3$, vertex is $(2,3)$

$y=3x^2-6x+1$, $y=3(x-1)^2-2$, vertex is $(1,-2)$ and $\frac{1}{4p}=3, p=\frac{1}{12}$,

so the focus is $\left(1,-\frac{23}{12}\right)$. The slope of the line is $\frac{59}{12}$. The equation in $Ax+By=C$ form is $59x-12y=82$.

T $\frac{8}{3}$ Using similar triangles in the diagram, $\frac{3}{4}=\frac{2}{x}$.



$$x=\frac{8}{3}$$

$$\frac{R}{S\bullet T}=\frac{2-\sqrt{3}}{129\bullet\frac{8}{3}}=\frac{2-\sqrt{3}}{344}$$

7. $\frac{\pi}{2}$

A 34π center $(3,-5)$, $r=\sqrt{9+25}=\sqrt{34}$, area $=34\pi$

B $\sqrt{13}$ $y=4(x+2)^2+3$, vertex $(-2,3)$, distance from origin is $\sqrt{13}$

C 6 For this parabola to be tangent to the x-axis, means it has only one solution so the discriminant must be 0. $0=4k^2-36, k=6$

$$\frac{A}{B^2\bullet C-10}=\frac{34\pi}{68}=\frac{\pi}{2}$$

8. 30437

A -42 Do synthetic division with -5

B 389 $S_{130}=2+129\bullet 3=389$

C 30090 $11190=a_1+(210)(-90);=30090$

$$A+B+C=30437$$

9. 4 **A 1** Set the two equations equal to each other since they both equal *y*.

$$2 - \log\ (x-2) = -1 + \log_2 x;\ x = 4, y = 1$$

B 4 Solving the system,

$$x^2 - y^2 = 1, y = 2x - 3;\ x^2 - (2x-3)^2 = 1; 3x^2 - 12x + 10 = 0;$$

$x = \dfrac{6 \pm \sqrt{6}}{3}$. Sum is 4.

$AB = 4$

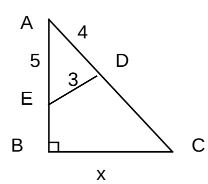
10. 84 **A 7** $g(2x) = x + g(2x-1); g(12) = 6 + g(11); g(12) = 6 + 1; g(12) = 7$

B 4 $f(x) = (2x+1); 2(3a-10) + 1 - 5; a = 4$

C $\frac{1}{3}$ $4 = -3x + 5$

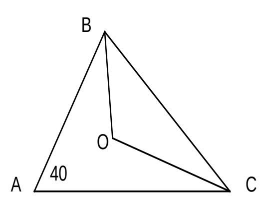
$$\frac{AB}{C} = \frac{7 \bullet 4}{\frac{1}{3}} = 84$$

11. 3360 **A** 96π With the sphere inscribed in the cone, the following triangle is formed.



Where ED is the radius of the sphere so there's a right angle EDA. Triangle ADE is similar to triangle ABC. Set up a proportion to solve for *x*. $\frac{3}{x} = \frac{4}{8}$, x = 6. Now use $\frac{1}{3}BH$ to find the volume 96π.

B 140



Let $m\angle OBC = m\angle ACO = x$. This makes $m\angle OCB = 40 - x, m\angle ABO = 100 - x$,

$$m\angle BOC = 180 - (m\angle OCB + m\angle OBC),$$

$$= 180 - (40 - x + x) = 140.$$

C 4π The side of the hexagon is 4 which makes the radius of the circumscribed circle 4. The area of the circumscribed circle is 16π. Drawing an equilateral triangle with vertices of the hexagon as one of the sides and drawing the radius of the inscribed circle, makes the radius $2\sqrt{3}$. Use the 30-60-90 rules.

$$\frac{AB}{C} = \frac{96\pi \bullet 140}{4\pi} = 3360$$

12. $(5,-3,4)$

$$\frac{A(x^2-4)}{x}+\frac{Bx(x-2)}{x+2}+\frac{Cx(x+2)}{x-2}=$$

$Ax^2-4A+Bx^2-2Bx+Cx^2+2Cx=6x^2+14x-20;$

$A+B+C=6; -4A=-20, A=5$.

$-2B+2C=14, -B+C=7$ and $B+C=1$.

Solving the system makes $C=4, B=-3$

13. $\frac{(a+b)^2}{ab}$ **or** $\frac{a^2+2ab+b^2}{ab}$

$$\frac{\frac{1}{a}+\frac{1}{b}}{\left(\frac{1}{\frac{1}{a}}+\frac{1}{\frac{1}{b}}\right)^{-1}}=\frac{\frac{b+a}{ab}}{\frac{1}{a+b}}=\frac{(a+b)^2}{ab} \text{ or } \frac{a^2+2ab+b^2}{ab}$$

14. $5-x$ **or** $-x+5$ **or –(x-5)**

$$\frac{(x-3)(x^2+3x+9)}{2(3+x)(3-x)}\bullet\frac{10(x-5)(x+3}{5(x^2+3x+9)}=\frac{\cancel{(x-3)}\cancel{(x^2+3x+9)}}{\cancel{2}\cancel{(3+x)}\cancel{(3-x)}}\bullet\frac{\cancel{10}(x-5)\cancel{(x+3)}}{\cancel{5}\cancel{(x^2+3x+9)}}=-1(x-5)=5-x$$