1. Let $f(x)=\dfrac{x-1}{x+2}$ and $g(x)=\sqrt{9-x^2}$ and $h(x)=e^{x+2}$.

$A=$ the value of the least integer in the domain of g.
B: The horizontal asymptote of the graph of f has equation $y=B$.
$C=$ the value of $f\left(f\left(\dfrac{1}{2}\right)\right)$.
$D=$ the real value of x for which $h(x)=1$.

Give the value of $A \bullet B \bullet C \bullet D$.

2. $S=\{\sqrt{\pi^2},\ \sqrt[3]{0.8},\ \sqrt[3]{-1},\ \sqrt{(0.16)^{-1}}\}$ $T=\left\{1, 3, 5, \dfrac{-1}{7}\right\}$

Consider the sets S and T above, each with four members. $[x]$ is defined as the greatest integer less than or equal to x.

A is the least RATIONAL member of set S.
B is the least value of $[x]$ for x a member of set T.
C is the sum of the positive prime (integer) members of both sets.
D is the greatest value of $[x]$ for x a member of either set.
Give the value of $A+B+C+D$.

3. ***A:*** $3+\sqrt{3}+\dfrac{1}{3+\sqrt{3}}+\dfrac{1}{\sqrt{3}-3}=x+y\sqrt{z}$ for z a prime number. Let $\boldsymbol{A}=x \bullet y \bullet z$..

B: If the edge of a cube is increased by 50% then the surface area of the cube is increased by $\boldsymbol{B}\%$.

***C*=** The **least positive value of θ** for which the graph of $r=3\sin(2\theta)$ has maximum radius (r).

D **=** $\ln(\tan\left(\dfrac{\pi}{4}\right))+Cos^{-1}\left(-\dfrac{1}{2}\right)$.

Give the value of $A+B+\dfrac{12 \bullet C \bullet D}{\pi^2}$.

4. $A=\left(\cos\dfrac{\pi}{3}+i \bullet \sin\dfrac{\pi}{3}\right)^2$ $B=\dfrac{1}{i^{101}}$

$C=$ the real zero of the function $f(x)=x^3-2x^2+x-2$.

$D=$ the rational value of p if the function $g(x)=x^3-qx^2-4x+p$ has zeros (roots) which include $\sqrt{7}+1$ and 1. q and p both are rational constants. Give the value of $\dfrac{A \bullet C \bullet D}{B}$.

5. $f(x)=\frac{1}{8}(x+2)^2+3$ $g(x)=\frac{\sqrt{36-4x^2}}{3}$ $h(x)=\ln|x-1|$

$A=$ the sum of the coordinates of the focus of the graph of f.

$B=$ the maximum $y-$value of the graph of g.

$C=$ the value of k for which $h(17)=k \bullet \ln(2)$.

$D=$ the positive value of x for which $g(x)=\frac{2}{3}$.

Give the value of $A \bullet B \bullet C \bullet D$.

6. In ΔRST, $RS=5$ and $RT=6$.

A: If the area of ΔRST is $\frac{15}{2}$ and $\angle R$ is acute, then $m\angle R = A$ radians.

B: If $ST=4$ then B is the value of $\cos R$.

C: If $m\angle T = 30^{\circ}$ and ΔRST is acute then $\cos S = C$.

D: If the perimeter of ΔRST is 18 then D is the area of ΔRST.

Give the value of $5 \bullet A \bullet B \bullet C \bullet D$.

7. $A=\frac{1}{4}\sqrt{2}+\frac{1}{16}\sqrt{2}+\frac{1}{64}\sqrt{2}+\ldots$

$B=$ the value of $(x-y)$ when $4^{3x+y}=\frac{1}{16}$ and $3^{x+y}=\frac{1}{81}$.

$C=$ the positive value of k to make $x^2-2kx+12$ have one real root of multiplicity 2.

$D=$ the coefficient of the 3rd term of the expansion of $(x-2y)^5$.

Give the value of $A \bullet B \bullet C \bullet D$.

8. $f(x)=x^2-1$ $g(x)=x^2+2x$ $h(x)=x+1$

$A=$ the least value of k so that $g(h(k))=35$.

B = the real value of p so that $\log(f(p))-\log(h(p))=1$.

$C=$ the value of m so that $f(m)-g(m)=\frac{1}{3} \bullet h(m)$.

$D=$ the sum of the real values of n so that $\sqrt{g(n)+1}=4$.

Give the value of $A+B+7C+D$.

9. A function is defined parametrically by $x(t)=2-t$ and $y(t)=\dfrac{1}{4+t}$.

$A=$ the y-intercept of the graph of the function on the xy-plane.

$B=\lim\limits_{t\to\infty} y(t)$

$C=$ the product of the x- and y-coordinates of the function when $y(t)=-\dfrac{1}{6}$.

$D=$ the value of k such that the equation $x=k$ is an asymptote of the graph of the function on the xy-plane.

Give the value of $B+\left(A\bullet C\bullet D\right)$.

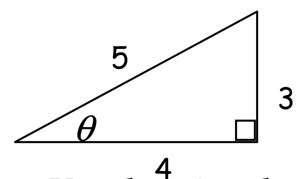
10. $A=\cos(2\theta)$

$B=\sin\left(\theta+\dfrac{\pi}{2}\right)$

$C=\sin(\pi-\theta)$

$D=\cos(-\theta)$

Give the value of $(5A)+B+C+D$.



Use the triangle above and acute angle θ as shown for question #10.

11. $i=\sqrt{-1}$. $A+Bi$ is the value of $\left(\cos\dfrac{\pi}{3}+i\sin\dfrac{\pi}{3}\right)^4$.

$C+Di$ is the solution of the equation $x^3=i$, where $C>0, D>0$.

Give the value of $A+B+C+D$.

12. The completely factored form of x^6-1 has two binomial factors and two trinomial factors.

A= the sum of the constant terms of each of these four polynomial factors.

Find B and C such that $\sqrt{B}+\sqrt{C}=\sqrt{3+\sqrt{8}}$, so $B>C$ and B and C are rational constants.

Find D such that $\dfrac{1}{D-1}+\dfrac{1}{D+1}=-\dfrac{4}{3}$ and $D>0$.

Give the value of $A\bullet B\bullet C\bullet D$.

13. 31 students were surveyed about courses they were taking in college.
10 students were taking Advanced Algebra. 12 students were taking Chemistry. 15 students were taking Biology.
5 students were taking Advanced Algebra and Chemistry. 1 student was taking Biology and Advanced Algebra. 2 students were taking Chemistry and Biology. 1 student took all three courses.
Let R be the number of students who took Advanced Algebra but not Chemistry and not Biology.
Let S be the number of students who took Chemistry and Biology but not Advanced Algebra.
Let T be the number of students who took none of these three courses.
Give the value of $R\bullet S\bullet T$.

14. John ate $\frac{1}{2}$ of a pile of M&Ms®. Mary at $\frac{1}{4}$ of the remaining M&Ms®.

$A =$ the number of M&Ms® in the original pile (before John ate some) if there were 21 M&Ms® left after Mary ate her share.

$B =$ the percent of M&Ms® that Mary ate, of the original pile (before John ate some).

$C =$ the percent of decrease of the number of M&Ms® from the original pile to the pile that Mary left, if there were 21 M&Ms® in the original pile.

Give the value of $A + B + C$.

15.

Consider the polar graphs $P : r = 4\cos\theta$, $Q : r = 6$, and $S : r = 3 - 4\cos\theta$.

$A =$ the area of the graph P.
$B =$ the area of the graph Q.

$C =$ the y-coordinate of the point, in rectangular form, on the curve of S when $\theta = -\frac{\pi}{2}$.

$D =$ the minimum $x-$coordinate of graph S, when graphed on the $xy-$plane.

Give the value of $A + B + C \bullet D$.