1. D $7+3\cdot 2-10\div 5=7+6-2=11$.

2. D $2010=10\cdot 201=2\cdot 5\cdot 3\cdot 67$, giving four prime factors.

3. A If I represents the identity element, then $I@x=x@I=x$ for all x. Since $1@x=x@1=x$ in the table, then 1 is the identity.

4. C $3^{2(2x+5)}=3^{3(7x-11)}$, so $2(2x+5)=3(7x-11)$, $4x+10=21x-33$, $17x=43$, and $x=\frac{43}{17}$. $P+Q=43+17=60$.

5. B Rewrite as $\frac{x-3}{11-x}-1\geq 0$. Then, $\frac{x-3}{11-x}-\left(\frac{11-x}{11-x}\right)\geq 0$, and $\frac{2x-14}{11-x}\geq 0$. Solutions are $x=7,8,9,10$, so there are four solutions.

6. A $-3(1)(3)+5(4)(-2)+1(2)(-1)-(-2)(1)(1)-(-1)(4)(-3)-3(2)(5)$
$=-9-40-2+2-12-30=-91$.

7. D There are $\frac{2010}{3}=670$ red, $\frac{2010}{2}=1005$ blue, 100 yellow. Number of green is $2010-670-1005-100=235$. Probability of green is $\frac{235}{2010}=\frac{47}{402}$, so $K=47$, and sum of digits of K is $4+7=11$.

8. B Each step is $\frac{1}{2}$ since each step begins for $x\in\left\{...,-1,-\frac{1}{2},0,\frac{1}{2},1,...\right\}$.

9. D Last digit of powers of 2 repeats 2, 4, 8, 6, etc., so 2^{2010} ends in 4. Last digit of powers of 3 repeats 3, 9, 7, 1, etc., so 3^{2010} ends in 9. Last digit of powers of 5 is always 5. So, last digit of sum will be last digit of $4+9+5=18$, so the last digit of the sum is 8.

10. A Use synthetic division or other methods to find roots $-4<1<\frac{3}{2}<2$.

Answer is $-4^{1}+\frac{3}{2}(2)=-1$.

11. A Number of ways to fill the offices is $10(9)(8)=720$. There are

$4(3)(2)=24$ ways to have all boys in the offices, and $6(5)(4)=120$ ways for all girls to fill the offices, so exclude these possibilities. Answer is $710-120-24=576$.

12. C

$$\frac{2}{(1+i)+\sqrt{5}}\left(\frac{(1+i)-\sqrt{5}}{(1+i)-\sqrt{5}}\right)=\frac{2+2i-2\sqrt{5}}{(1+i)^2-5}=\frac{2+2i-2\sqrt{5}}{\cancel{1}+2i+\cancel{i^2}-5}=\frac{2+2i-2\sqrt{5}}{2i-5}$$

$$=\frac{2+2i-2\sqrt{5}}{2i-5}\left(\frac{2i+5}{2i+5}\right)=\frac{4i+10+4i^2+10i-4i\sqrt{5}-10\sqrt{5}}{4i^2-25}$$

$$=\frac{4i+10-4+10i-4i\sqrt{5}-10\sqrt{5}}{-4-25}=\frac{6-10\sqrt{5}+\left(14-4\sqrt{5}\right)i}{-29}$$

So, $P=6$, $Q=-10$, and $R=14$, and $P+Q+R=10$.

13. A

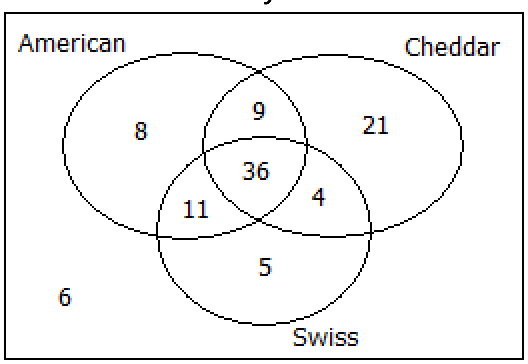
This means that 25% of the weight is cashews, so if there are 4 pounds of cashews, then there must be 16 pounds of nuts altogether. There are $16-4=12$ pounds of walnuts in the new mix, so 6 pounds of walnuts are added.

14. B

$\frac{x+2}{x}=3$, so $x=1$. $5+2(1)-1^2=5+2-1=6$.

15. C

The Venn Diagram shows 94 students inside the circles, so $100-94=6$ do not like any of the cheeses.



16. A

$a_n=a_1+(n-1)d$, so $a_{2010}=7+(2009)4=8043$, and sum of digits is $8+0+4+3=15$.

17. A

Consider that $(x+y)^2=x^2+2xy+y^2$. So, $10^2=x^2+2(20)+y^2$, making $x^2+y^2=60$. Now, $x^3+y^3=(x+y)\left(x^2+y^2-xy\right)=10(60-20)=400$.

18. C

$$\prod_{n=1}^{2010} i^n=i\cdot i^2\cdot i^3\cdot\ldots\cdot i^{2010}=i^{1+2+3+\ldots+2010}=i^{\frac{2010}{2}(1+2010)}=i^{2021055}=i^3=-i.$$

19. D After completing the square, the first equation is $(x-3)^2+(y+4)^2=K_1$, and the second equation is $2(x+5)^2-3(y-6)^2=K_2$ for positive constants K_1 and K_2.
Centers are $(3,-4)$ and $(-5,6)$, and distance is $\sqrt{(3-(-5))^2+(-4-6)^2}=\sqrt{164}=2\sqrt{41}$.

20. D Before the board, the ball bounces $60+2(40)=140$. After that, it bounces $2\left(10+\frac{2}{3}(10)+\frac{2}{3}\left(\frac{2}{3}(10)\right)+...\right)=2\left(\frac{10}{1-\frac{2}{3}}\right)=2(30)=60$. Total distance is $140+60=200$.

21. C $f(1)=3$, $f(2)=2f(1)+7=2(3)+7=13$, $f(3)=2f(2)+7=2(13)+7=33$, and so on. Values for f are $f(4)=73$, $f(5)=153$, $f(6)=313$, $f(7)=633$, and $f(8)=1273$. Sum of digits is $1+2+7+3=13$.

22. C Diameter of circle is 1, and diagonal of smaller square is 1. So each side of the smaller square is $\frac{1}{\sqrt{2}}=\frac{\sqrt{2}}{2}$, and perimeter is $4\left(\frac{\sqrt{2}}{2}\right)=2\sqrt{2}$.

23. E Let $x=\sqrt{12-\sqrt{12-\sqrt{12-...}}}=\sqrt{12-x}$. So, $x^2=12-x$, and $x^2+x-12=(x+4)(x-3)=0$. The only positive solution is $x=3$. This makes $12-\sqrt{12-\sqrt{12-\sqrt{12-...}}}=12-3=9$.

24. A $f(x)=\dfrac{3x^2+x+4}{(x-4)(x-2)}$, so vertical asymptotes are $x=2$ and $x=4$, and $P=2$, $Q=4$. Horizontal asymptote is $y=\frac{3}{1}=3$, so $R=3$.
$P^R+Q=2^3+4=12$.

25. E There are three possibilities:
(1) $x^2-7x+11=1$, so $x^2-7x+10=0$, and $x=2$ or $x=5$.
(2) $x^2+17x+72=0$, so $x=-8$ or $x=-9$.
(3) $x^2-7x+11=-1$ as long as $x^2+17x+72$ is even:

$x^2 - 7x + 12 = 0$, so $x = 3$ or $x = 4$ (both make the exponent even).
There are six solutions.

26. B $f(-2) = (-2)^3 = -8$. $f(-8) = 4 - 3(-8) = 28$.

27. C $\log \frac{343}{16} = \log 343 - \log 16 = \log 7^3 - \log 2^4 = 3\log 7 - 4\log 2 = 3b - 4a$.

28. D I. $P(0) = \frac{100}{1+3e^0} = \frac{100}{1+3} = 25$.
II. Max population occurs as $t \to \infty$ (meaning $e^{-0.1t} \to 0$); max population is $\frac{100}{1+0} = 100$.
III. As t increases, $e^{-0.1t}$ decreases, but $P(t)$ increases.
All three statements are true.

29. D Area between the absolute value graphs is a square with diagonal 4, so area is $\frac{1}{2} \cdot 4^2 = 8$. Area inside square but below $y = 1$ is a triangle with base 2 and height 1, so area of triangle is $\frac{1}{2}(2)(1) = 1$. Bounded area is $8 - 1 = 7$.

30. D Expansion begins $(4x)^{\frac{1}{2}} + \frac{1}{2}(4x)^{-\frac{1}{2}} y - \frac{1}{8}(4x)^{-\frac{3}{2}} y^2 + \frac{1}{16}(4x)^{-\frac{5}{2}} y^3$.
Fourth term is $\frac{1}{16}(4x)^{-\frac{5}{2}} y^3 = \frac{1}{16}\left(\frac{1}{32}\right) x^{-\frac{5}{2}} y^3 = \frac{1}{512} x^{-\frac{5}{2}} y^3$.