1. (b) Not true if one is Empty set.

2. (a) $S_n = 5n^2 + 2n.S_{n-1} = 5(n-1)^2 + 2(n-1)$
   nth term = $T_n = S_n - S_{n-1} = 10n - 3$
   Hence $T_3 = 27$

3. (c)

4. (c) No. of terms in the given series are 102 and 91 respectively. 13, 17, 21, 25, 29, 33, 37, 41, ...
   16, 21, 26, 31, 36, 41, ...
   Therefore every 5th term of first series, starting from 3rd term is common to both the series, so does every 4th term of second series starting from 2nd term. Number of such terms is 20 in first series 22 in the second series. Hence there are 20 common terms in the two.

5. (a) AC = CB = 3m
   OCB is a right angled triangle. With one side three and rest two integers. Hence radii are 4m and 5m respectively.

6. (b) Let A denotes families having radios. B, the families having TV and C, the families having VCR.
   $A \cap B \cap C = 10$, $A \cap C = 25$
   $A - (B \cup C) = 75 - (10 - 30)$

7. (c)

8. (d) Suppose CP of the horse = Rs. x, then CP of the carriage is Rs. $(8000 - x)$.
   10% of x − 10% of $(8000 - x)$ = 2.5% of 8000
   $\Rightarrow$ 20% of $x = 1000$
   $\Rightarrow x = 5000$

9. (d) $(x + y) - xy = 20$, at least two equations are required.

10. (d) All are standard results.

11. (a) Sides of the triangle are a = 9, b = 7 and c = 8
   S = (a + b + c)/2
   Area = $\sqrt{S(S-a)(S-b)(S-c)}$

12. (c) 20*10*10. Inner dimensions are length 20, breadth 10 and height 10 (because it's open from top)

13. (b) If initially, she gets x mangoes for 1.20.
   Price of dozen mangoes is (1.2 * 12)/x = 14.4/x.
   After getting 2 extra mangoes, price per dozen = (1.2*12)/(x+2)=14.4/(x+2)
   Given (14.4/x) – 14.4/(x+2) = 0.1
   Solving we get x = 16.x + 2
   = 18 (for, she get 2 extra).

14. (a) Since AB and CD subtends equal angles at center
   $\Rightarrow$ AB = CD
   Triangle COD is equilateral. Radius r = 6.
   $\angle OAC = \angle OCA = 30°$
   $AC = 2r\cos 30° = 6\sqrt{3}$.
   Perimeter = $2(6 + 6\sqrt{3}) = 12(1 + \sqrt{3})$

15. (b) Code is $A \rightarrow Z, B \rightarrow Y, C \rightarrow X$ and so on.

16. (b) In one day Sunil makes 3/2 tables Abhishek makes 5/2 tables. Together they make 8/2 = 4 tables.

17. (b) If initial speed is V then at the of 4th lap speed
   $= (2/3)^4 * V = 16$. $V = 81$

18. (d) If x is an odd prime no. then $x^2 + 5$ is even and hence not prime. If x is even prime no. then x should be $2 \Rightarrow x^2 + 5 = 9$ not prime.

19. (c) Altitude of triangle = $2\sqrt{3} * \sqrt{3}/2 = 3cm$.
   Circumradius = 2/3rd of altitude (Only for equ. Δ's) = 2cm.
   Inradius = 1/3rd of altitude (only for equ. Δ's) = 1cm.

20. (c) If side of outer square is 2a then that of inner square is $a\sqrt{2}$.
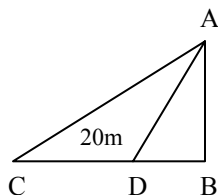   Area of ABCD = $4a^2$.
   Area of inner $A_1B_1C_1D_1$
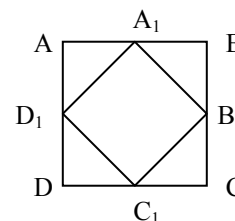
$$= 2a^2$$
$$= 4a^2 * 2^{-1}$$

Similarly area of $A_{10}B_{10}C_{10}D_{10}$

$$= 4a^2 * 2^{-10}. \text{ Ratio} = 2^{10}.$$

21. (b) $\sin\alpha\cos\alpha = \dfrac{1}{2}\sin 2\alpha$

22. (b) Let AB be the tower $\angle ACD = 30$

$\angle ADB = 60$
$\Rightarrow \angle DAC = 60 - 30 = 30°$
$CD = AD = 20$ m
$AB = AD \sin 60$
$= 10\sqrt{3}$

23. (b) $^{18}C_2 - ^5 C_2 + 1 = 153 - 10 + 1 = 144$

24. (b) $[100/3] + [33/3] + [11/3] + [3/3]$
$= 33 + 11 + 3 + 1$

25. (a) If $x - 15 > 0$, then we get $x = -15$. But this is not the solution.
Now, if $x - 15 < 0$ then

$\log(x - 15)^4 = 4\log(15 - x)$ and the origional equation reduces to
$\log 2x = \log(15 - x) \Rightarrow x = 5$

Note: If we consider only $\log m^n = n \log m$, we may not get the required solution.