

மாதிரிப் பொதுத்தேர்வு - ஜனவரி 2016 விடைக் குறிப்புகள் - கணிதம் / Answer Key - MATHS

பிரிவு - I (ஒவ்வொரு விடைக்கும் ஒரு மதிப்பெண் வழங்குக)

01. (அ)  $\phi$  (ஆ)  $\phi$  02. (அ) ஒரு கூட்டுத் தொடர்வரிசை (ஆ) an A.P. 03. (அ) 21 (ஆ) 21 04. (அ)  $x+1$  (ஆ)  $x+1$   
 05. (அ)  $x^2 - 5x + 6 = 0$  (ஆ)  $x^2 - 5x + 6 = 0$  06. (அ) 4 (ஆ) 4 07. (அ) (1, 7) (ஆ) (1, 7) 08. (அ)  $x+2 = 0$  (ஆ)  $x+2 = 0$   
 09. (அ) 60 மீ (ஆ) 60 m 10. (அ) 24 செ.மீ (ஆ) 24 cm 11. (அ) 1 (ஆ) 1 12. (அ) -9 (ஆ) -9 13. (அ) 10 செ.மீ (ஆ) 10 cm  
 14. (அ) 10 (ஆ) 10 15. (அ) 0.39 (ஆ) 0.39

பிரிவு-II / SECTION-II (மதிப்பெண்கள் : 20 / Marks : 20)

16.  $n(A \cup B) = n(A) + n(B) - n(A \cap B) = 200 + 300 - 100 = 400$  1  
 $n(A' \cap B') = n(A \cup B)' = n(U) - n(A \cup B) = 700 - 400$  1
17.  $f(x) = 2x - 1$ ,  $f(5) = 2(5) - 1 = 10 - 1 = 9$   $\diamond$   $a = 9$  1  
 $f(8) = 2(8) - 1 = 16 - 1 = 15$   $\diamond$   $b = 15$  1
18.  $b^2 - 4ac = (-28)^2 - 4 \times 4 \times 49 = 784 - 784 = 0$   $\therefore$  மூலங்கள் மெய் மேலும் சமம் Roots are real and equal 1
19.  $\sqrt{121x^8y^6 \div 81x^4y^8} = \sqrt{\frac{121x^8y^6}{81x^4y^8}} = \sqrt{\frac{11^2x^4}{9^2y^2}} = \frac{11}{9} \left| \frac{x^2}{y} \right|$  1 + 1
20.  $\begin{pmatrix} 3 & 5 \\ 1 & 2 \end{pmatrix} \times \begin{pmatrix} 2 & -5 \\ -1 & 3 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = I$ ,  $\begin{pmatrix} 2 & -5 \\ -1 & 3 \end{pmatrix} \times \begin{pmatrix} 3 & 5 \\ 1 & 2 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = I$  1 + 1
21.  $\begin{pmatrix} 2x + y \\ x - 3y \end{pmatrix} = \begin{pmatrix} 5 \\ 13 \end{pmatrix}$ ,  $2x + y = 5$  ..... (1)  
 $x - 3y = 13$  ..... (2)  
 $(1) \times 3 \Rightarrow 6x + 3y = 15$  ..... (3)  
 $(2) + (3) \Rightarrow 7x = 28$ ,  $x = 4$ ,  $x = 4$  என சமன்பாடு 1-ல் பிரதியிட  
 $\Rightarrow 2 \times 4 + y = 5$ ,  $y = 5 - 8 = -3$  1
22. A(4, -1), B(6, 0), C(7, 2), D(x, y) என்க. Let A(4, -1), B(6, 0), C(7, 2), D(x, y)  
 சாய்சதுரம் ABCDல் மூலைவிட்டம் BDன் நடுப்புள்ளி = மூலைவிட்டம் ACன் நடுப்புள்ளி  
 In Rhombus ABCD Mid point of BD = Mid point of AC  
 $\left( \frac{6+x}{2}, \frac{0+y}{2} \right) = \left( \frac{4+7}{2}, \frac{-1+2}{2} \right)$ ,  $x = 5, y = 1$  1 + 1
23.  $5x - 2y - 9 = 0$  என்ற நேர்க்கோட்டின் சாய்வு Slop of  $5x - 2y - 9 = 0$   $m_1 = \frac{-b}{a} = \frac{-5}{-2} = \frac{5}{2}$   
 $ay + 2x - 11 = 0$  என்ற நேர்க்கோட்டின் சாய்வு Slop of  $ay + 2x - 11 = 0$   $m_2 = \frac{-b}{a} = \frac{-2}{a}$  1  
 $m_1 \times m_2 = -1 \therefore \frac{5}{2} \times \frac{-2}{a} = -1 \Rightarrow a = 5$  1
24.  $PC \times PD = PA \times PB \Rightarrow (x+3) \times 3 = 9 \times 5 \Rightarrow x+3 = \frac{9 \times 5}{3}$  1  
 $x+3 = 15 \Rightarrow x = 15 - 3 = 12$  1
25.  $r_1 : r_2 = 2 : 3$ ,  $h_1 : h_2 = 5 : 3$ , கன அளவுகளின் விகிதம் ratio of the volumes =  $\pi r_1^2 h_1 : \pi r_2^2 h_2$  1  
 $= 2 \times 2 \times 5 : 3 \times 3 \times 3 = 20 : 27$  1
26. செங்கோண முக்கோணம் ABCல்  $\tan \theta = \frac{AB}{BC} = \frac{150}{150\sqrt{3}} = \frac{1}{\sqrt{3}}$ ,  $\tan 30^\circ = \frac{1}{\sqrt{3}} \therefore \theta = 30^\circ$  1+1
27.  $r = 5$  cm and  $l = 13$  cm  $\therefore h = \sqrt{l^2 - r^2} = \sqrt{13^2 - 5^2} = \sqrt{169 - 25} = \sqrt{144} = 12$  cm 1  
 கன அளவு Volume =  $\frac{1}{3} \pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 5 \times 5 \times 12 = 314 \frac{2}{7} \text{ cm}^3$  1
28. புதிய திட்டவிலக்கம் / New SD =  $2 \times \sqrt{5} = 2\sqrt{5}$  புதிய வி.வ.ச / New Variance =  $(2\sqrt{5})^2 = 4 \times 5 = 20$  1+1
29.  $S = (1,1,1) \dots (6,6,6)$ ,  $n(S) = 216$ ,  $A = \{(1,1,1), (2,2,2), \dots, (6,6,6)\}$ ,  $n(A) = 6$ ,  $P(A) = 6/216 = 1/36$  1+1
30.  $A.P = 1 + 2 + 3 + \dots + 12$ ,  $S_n = \frac{n}{2}(a+l) = \frac{12}{2}(1+12) = 78$ , Answer (In a day 24 Hrs):  $2 \times 78 = 156$  1+1
30.  $\frac{\sqrt{1-\cos \theta}}{\sqrt{1+\cos \theta}} = \frac{\sqrt{1-\cos \theta}}{\sqrt{1+\cos \theta}} \times \frac{1-\cos \theta}{1-\cos \theta} = \frac{(1-\cos \theta)^2}{\sqrt{1-\cos \theta}^2} = \frac{1-\cos \theta}{\sin \theta} = \frac{1}{\sin \theta} - \frac{\cos \theta}{\sin \theta} = \text{cosec } \theta - \cot \theta$  1+1
- பிரிவு-III / SECTION-III (மதிப்பெண்கள் : 45 / Marks : 45).
31.  $A = \{-3, -2, -1, 0, 1, 2, 3\}$ ,  $B = \{1, 2, 3, 4\}$ ,  $C = \{-5, -3, -1, 0, 1, 3\}$ ,  $B \cup C = \{1, 2, 3, 4, -5, -3, -1, 0\}$   
 $A \cap (B \cup C) = \{-3, -1, 0, 1, 2, 3\}$  ( $A \cap B$ ) =  $\{1, 2, 3\}$ , ( $A \cap C$ ) =  $\{-3, -1, 0, 1, 3\}$ , ( $A \cap B$ )  $\cup$  ( $A \cap C$ ) =  $\{-3, -1, 0, 1, 2, 3\}$

32.  $x = \{6,9,15,18,21\}, f(x) = \{1,2,4,5,6\}$  -1 அம்புக்குறிப்பிடும் - 1, வரிசைச்சீராக உள்ள கணம்-1 அட்டவணை - 1 வரைபடம்- 1

33.  $S_n = 0.4 + 0.94 + 0.994 + \dots + n$  உறுப்புகள்  $= (1-0.6)+(1-0.06)+\dots + n$  உறுப்புகள்  $= n - (0.6+0.06+\dots+0.006+\dots+n)$   
 $= n - 6 \left[ \frac{1}{10} + \frac{1}{10^2} + \frac{1}{10^3} + \dots + n \text{ terms} \right] = n - \frac{2}{3} \left[ 1 - \left( \frac{1}{10} \right)^n \right]$  Formula  $S_n = \frac{a(r^n - 1)}{r - 1}$ .

34.  $a-d + a + a+d + a+2d = 20 \rightarrow d = 10 - 2a$ .  $(a-d)^2 + a^2 + (a+d)^2 + (a+2d)^2 = 120 \rightarrow 2a^2 + 2ad + 3d^2 = 60$  [ $d = 10 - 2a$ ]  
 $\therefore a^2 - 10a + 24 = 0$  Solution :  $a = 4$  or  $6$ , if  $a = 4, d = 2$ , so the terms 2, 4, 6, 8 If  $a = 6, d = -2$ , so the terms 8, 6, 4, 2

35.  $AB = x + 2, BC = 2x-1, AC=2x+1, AC^2 = AB^2 + BC^2 \rightarrow (2x+1)^2 = (x+2)^2 + (2x-1)^2 \rightarrow 4x^2 + 4x + 1 = (x^2 + 4x + 4) + (4x^2 - 4x + 1) \rightarrow x^2 - 4x + 4 = 0 \rightarrow x = 2$ . The sides are 4, 3, 5. Area  $= \frac{1}{2}bh = \frac{1}{2} \times 3 \times 4 = 12$  sq.

36.  $4 + 25x^2 - 12x - 24x^3 + 16x^4$  ன் வர்க்கமூலம்  $= |4x^2 - 3x + 2|$

37.  $x^2 - 3x + 2 = 0 \rightarrow \alpha + \beta = 3, \alpha\beta = 2$ .  $-\alpha - \beta = -3, (-\alpha)(-\beta) = 2$ , Equation:  $x^2 - (\alpha+\beta)x + \alpha\beta = 0 \rightarrow x^2 + 3x + 2 = 0$

38.  $A^2 = \begin{pmatrix} a^2 + bc & ab + bd \\ ac + cd & bc + d^2 \end{pmatrix}, (a+d)A = \begin{pmatrix} a^2 + ad & ab + bd \\ ac + cd & ad + d^2 \end{pmatrix}$ ,

$$A^2 - (a+d)A = \begin{pmatrix} bc - ad & 0 \\ 0 & bc - ad \end{pmatrix} = (bc - ad) \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} = (bc - ad) I_2$$

39.  $(a, 0), (0, b)$  ஆகிய புள்ளிகள் ஒரே நேர்க்கோட்டில் அமைகின்றன.  $\therefore \Delta$  ன் பரப்பு  $= 0 \rightarrow ab - bx - ay = 0$

$$\rightarrow bx + ay = ab \rightarrow \frac{x}{a} + \frac{y}{b} = 1.$$

40. Theorem 2 marks, Diagram 1 Mark Proof : 2 marks

41. Diagram 1 marks In Right Angled  $\Delta DCB, \tan 45^\circ = \frac{CD}{BC} = \frac{1.5}{BC} \rightarrow BC = 1.5$

In Right Angled  $\Delta DCA, \tan 30^\circ = \frac{1}{\sqrt{3}} = \frac{1.5}{AC} \rightarrow AC = 1.5\sqrt{3}$ .  $AB = AC - BC = 1.5\sqrt{3} - 1.5 = 1.5(\sqrt{3} - 1) = 1.098m$

42. Speed = 15000 m/h.  $r = \frac{7}{100}$  m,  $h = \frac{21}{100}$  m. Volume of water flowing in an hour  $= \frac{22}{7} \times \frac{7}{100} \times \frac{7}{100} \times 15000$

Volume of water flown in a tank  $= lbh = 50 \times 44 \times \frac{21}{100}$ . Volume of water flowing in T hour = Volume of water in a tank

$$\rightarrow \frac{22}{7} \times \frac{7}{100} \times \frac{7}{100} \times T \times 15000 = 50 \times 44 \times \frac{21}{100} \rightarrow T = 2 \text{ hours.}$$

43.  $\bar{x} = \frac{\sum x}{n} = 40 \rightarrow \sum x = 800$ , corrected  $\sum x = \sum x + \text{Correct value} - \text{wrong value} = 800 + 43 - 53 = 790$ . Corrected  $\bar{x} = 39.5$

Variance  $\sigma^2 = 225 \rightarrow \frac{\sum x^2}{20} - 40^2 = 225 \rightarrow \sum x^2 = 32000 + 4500 = 36500 \rightarrow \text{corrected } \sum x^2 = 36500 + 43^2 - 53^2 = 35540$

$$\text{corrected } \sigma^2 = \frac{\text{corrected } \sum x^2}{n} - (\text{corrected mean})^2 = \frac{35540}{20} - (39.5)^2 = 1777 - 1560.25 = 216.75 \rightarrow \text{corrected } \sigma = 14.72.$$

44.  $n(S) = 200$ . Bolts = 50, Nuts = 150. Rusted bolts and nuts  $n(A) = 100$ .  $P(A) = \frac{100}{200}$  Bolts  $n(B) = 50, P(B) = \frac{50}{200}$

$$n(A \cap B) = 25, P(A \cap B) = \frac{25}{200}. P(A \cup B) = \frac{100}{200} + \frac{50}{200} - \frac{25}{200} = \frac{5}{8}$$

45. a)  $\pi r_1^2 h_1 = \pi h(R^2 - r^2) \rightarrow \pi \times r_1^2 \times 20 = \pi \times 40 \times (12^2 - 4^2) \rightarrow r_1^2 = \frac{40(144 - 16)}{20} = 256 \rightarrow r_1 = 16$

b) Slope of  $8px + (2 - 3p)y + 1 = 0$  is  $m_1 = \frac{-8p}{2 - 3p}$ , Slope of  $px + 8y - 7 = 0$  is  $m_2 = \frac{-p}{8}$

$$m_1 \times m_2 = -1 \rightarrow \frac{-8p}{2 - 3p} \times \frac{-p}{8} = -1 \rightarrow p^2 - 3p + 2 = 0 \rightarrow (p-1)(p-2) = 0 \rightarrow p = 1 \text{ or } 2$$

**பிரிவு - IV / SECTION - IV (மதிப்பெண்கள் : 20 / Marks : 20)**

46. a) Rough Diagram = 2 Marks  $\rightarrow$  Draw AB 1 Mark  $\rightarrow$  Triangle 3 Marks  $\rightarrow$  bisector 1 Mark  $\rightarrow$  Circle 2 Marks  
 Completing ABCD = 1 Mark

b) Rough Diagram 2 Marks  $\rightarrow$  Draw BC 1 Mark  $\rightarrow$  Circle 3 Marks  $\rightarrow$  Complete the Triangle 3 Marks  $\rightarrow$  Length of Altitude 1 Mark

47. a) Scale 2 Marks  $\rightarrow$  Calculation Table Points  $(-4,6), (-3, 2), (-2, 0), (-1, 0), (0, 2), (1, 6), (2, 12), (3, 20)$  2 Marks  $\rightarrow$   
 Draw Parapola 2 Marks  $\rightarrow$  Equation  $y = x - 2$  1 Mark  $\rightarrow$  Second Table 1 Mark  $\rightarrow$  Draw Straight line 1 Mark  $\rightarrow$   
 Solution (No solution)  $\rightarrow$  1 mark

b) Scale 2 Marks  $\rightarrow$  Calculation Table Points  $(1,20), (2,10), (4, 5), (5, 4)$  3 Marks  $\rightarrow$  Draw Parapola 3 Marks  $\rightarrow$   
 Solution (If  $x = 5, y = 4$  and  $y = 10$  then  $x = 2$ )  $\rightarrow$  2 marks