Paper II (Set 1) Suggested solution

1.D	6.C	11.D	16.B	21.D	26.C	31.C	36.C	41.B
2.C	7.B	12.A	17.B	22.B	27.D	32.A	37.C	42.B
3.A	8.A	13.C	18.C	23.D	28.C	33.C	38.A	43.B
4.D	9.C	14.C	19.B	24.B	29.B	34.C	39.C	44.C
5.B	10.D	15.B	20.B	25.C	30.C	35.C	40.B	45.C

1. The answer is D.

$$\frac{2}{x+3}+\frac{3}{x+5}=1$$
$$2(x+5)+3(x+3)=(x+3)(x+5)$$
$$2x+10+3x+9=x^2+8x+15$$
$$x^2+3x-4=0$$
$$(x+4)(x-1)=0$$
$$x=-4 \text{ or } 1$$

2. The answer is C.

$$8x^9-7x^6-x^3=0$$
$$x^3(x^3-1)(8x^3+1)=0$$
$$x^3=0,\ 1 \text{ or } -\frac{1}{8}$$
$$x=0,\ 1 \text{ or } -\frac{1}{2}$$

3. The answer is A.

$$2^{2x+1}+7(2^x)-4=0$$
$$2(2^x)^2+7(2^x)-4=0$$
$$(2\cdot 2^x-1)(2^x+4)=0$$
$$2^x=\frac{1}{2} \text{ or } -4 \text{ (Rejected)}$$
$$x=-1$$

4. The answer is D.

$$\log(x+2)+\log(x+7)=\log(x-1)$$
$$\log(x+2)(x+7)=\log(x-1)$$
$$(x+2)(x+7)=x-1$$
$$x^2+9x+14=x-1$$
$$x^2+8x+15=0$$
$$(x+3)(x+5)=0$$
$$x=-3 \text{ (Rejected) or } -5 \text{ (Rejected)}$$

5. The answer is B.

$$2x-3=\sqrt{4x-3}$$
$$(2x-3)^2=4x-3$$
$$4x^2-12x+9=4x-3$$
$$4x^2-16x+12=0$$
$$x^2-4x+3=0$$
$$(x-3)(x-1)=0$$
$$x=3 \text{ or } 1 \text{ (Rejected)}$$

6. The answer is C.

$$\cos^2 x-\cos x-\sin^2 x=0$$
$$\cos^2 x-\cos x-(1-\cos^2 x)=0$$
$$2\cos^2 x-\cos x-1=0$$
$$(\cos x-1)(2\cos x+1)=0$$
$$\cos x=1 \text{ or } -\frac{1}{2}$$
$$x=0°,\ 120° \text{ or } 240°$$

7. The answer is B.

Let the time taken for Zhu be *x*.

$\frac{1}{x}+\frac{1}{x+6}=\frac{1}{4}$

$4(x+6)+4x=x(x+6)$

$8x+24=x^2+6x$

$x^2-2x-24=0$

$(x-6)(x+4)=0$

$x=6$ or -4(Rejected)

The time taken for Zhu is 6 seconds.

8. The answer is A.

Each student originally gets $\frac{40000}{X}$

If there are 100 more students, each student can get $\frac{40000}{X+100}$.

$\frac{40000}{X}-20=\frac{40000}{X+100}$

9. The answer is C.

$\frac{5+i}{2-i}$

$=\frac{5+i}{2-i}\times\frac{2+i}{2+i}$

$=\frac{10+5i+2i+i^2}{4-i^2}$

$=\frac{9+7i}{5}$

$=\frac{9}{5}+\frac{7}{5}i$

10. The answer is D.

$(2a+bi)-(2b+4i)=-5b-2ai$

$(2a-2b)+(b-4)i=-5b-2ai$

$2a-2b=-5b$.............(1)

$b-4=-2a$................(2)

By solving (1) and (2),

$a=3,\ b=-2$

11. The answer is D.

$(2+2ai)(3-i)$

$=6-2i+6ai-2ai^2$

$=(6+2a)+(6a-2)i$

For a real number,

$6a-2=0$

$a=\frac{1}{3}$

The number $=6+2(\frac{1}{3})=\frac{20}{3}$

12. The answer is A.

$(1+2i)^2+b(1+2i)+5=0$

$(-3+4i)+(b+2bi)+5=0$

$(-3+b+5)+(4+2b)i=0$

$\therefore \begin{cases} 2+b=0 \\ 4+2b=0 \end{cases}$

$b=-2$

13. The answer is C.

$\sqrt{-121}-\sqrt{-64}-\sqrt{16}$

$=\sqrt{121}\times\sqrt{-1}-\sqrt{64}\times\sqrt{-1}-4$

$=11i-8i-4$

$=-4+3i$

14. The answer is C.

$$\begin{cases} y = -3x^2 - 17x - 20 \text{............(1)} \\ y = 6x + 20 \text{..........................(2)} \end{cases}$$

Put (2) into (1),

$6x + 20 = -3x^2 - 17x - 20$

$3x^2 + 23x + 40 = 0$

$(x+5)(3x+8) = 0$

$x = -5 \text{ or } -\dfrac{8}{3}$

When $x = -5,\ y = 6(-5) + 20 = -10$

When $x = -\dfrac{8}{3},\ y = 6(-\dfrac{8}{3}) + 20 = 4$

15. The answer is B.

$$\begin{cases} y = \dfrac{1}{x^2} - \dfrac{7}{x} - 35 \text{...............(1)} \\ \dfrac{3}{x} - y - 11 = 0 \text{.................(2)} \end{cases}$$

Put (1) into (2),

$\dfrac{3}{x} - \left(\dfrac{1}{x^2} - \dfrac{7}{x} - 35\right) - 11 = 0$

$\dfrac{1}{x^2} - \dfrac{10}{x} - 24 = 0$

Let $z = \dfrac{1}{x},\ z^2 - 10z - 24 = 0$

$(z-12)(z+2) = 0$

$z = 12 \text{ or } -2$

$x = \dfrac{1}{12} \text{ or } -\dfrac{1}{2}$

16. The answer is B.

$x^2 - 8x + 20 = 6$

$x^2 - 8x + 14 = 0$

x-coordinate of Mid-point of $AB = -\dfrac{-8}{2} = 4$

Mid-point of $AB = (4,\ 6)$

17. The answer is B.

$$\left(3-\sqrt{18}\right)x<-2$$

$$x>\frac{-2}{3-\sqrt{18}}$$

$$x>\frac{-6-2\sqrt{18}}{9-18}$$

$$x>\frac{-6-6\sqrt{2}}{-9}$$

$$x>\frac{2\left(1+\sqrt{2}\right)}{3}$$

18. The answer is C.

$5(x+3)<30-5x$ or $\frac{3x+7}{2}<2x$

$5x+15<30-5x$ or $3x+7<4x$

$10x<15$ or $x>7$

$x<\frac{3}{2}$ or $x>7$

19. The answer is B.

$5t$ is negative and $\frac{t^2}{10}$ is positive

$\therefore$ (1) is true.

$-t$ is positive and $t-2$ is negative

$\therefore$ (2) is false.

$\frac{6}{t}$ and $\frac{5}{t}$ are negative.

$\therefore \frac{6}{t}<\frac{5}{t}$

(3) is true.

20. The answer is B.

$$\frac{1}{1+5}<\frac{x}{x+y}<\frac{4}{4+4}$$

$$\frac{1}{6}<\frac{x}{x+y}<\frac{1}{2}$$

21. The answer is D.

If $x > \beta$,

$x^2 + 2x + 4 > 7$

$x^2 + 2x - 3 > 0$

22. The answer is B.

Has real roots $\Rightarrow \Delta = 4^2\left(k-3\right)^2 - 16 \geq 0$

$16\left(k^2 - 6k + 8\right) \geq 0$

$k \leq 2$ or $k \geq 4$

23. The answer is D.

Sub $x = -7$ into $x^2 + 12x + c = 0$,

$(-7)^2 + 12(-7) + c = 0$

$c = 35$

$x^2 - 12x + 35 > 0$

$(x-5)(x+7) > 0$

$x < 5$ or $x > 7$

24. The answer is B.

$\angle BOA = 180° \times \frac{4}{5} = 144°$

$OA = OB$ (Radius)

$\angle OAB = \frac{180° - 144°}{2} = 18°$ ($\angle$ sum of Δ)

$\angle EBA = 180° - 126° - 18° = 36°$ ($\angle$ sum of Δ)

$\angle CBA = 90°$ ($\angle$ in semi-circle)

$\angle CBD = 90° - 36° = 54°$

$\overset{\frown}{DC} : \overset{\frown}{CB} = \angle CBD : \angle CAB = 54° : 18° = 3 : 1$

25. The answer is C.

$MP = NP = 7$ (Tangent properties)

$\angle OMQ = \angle ONP = 90°$ (Tangent $\perp$ to radius)

$\therefore PQ = \sqrt{7^2 + 24^2} = 25$

Let the radius of the circle be r.

$r^2 + (25+7)^2 = (24+r)^2$

$r^2 + 1024 = 576 + 48r + r^2$

$r = \dfrac{28}{3}$

26. The answer is C.

Join AB.

$\angle CBQ = 180° - 115° = 65°$

$\angle CAM = 180° - 105° = 75°$

$\angle CAB = \angle CBQ = 65°$ ($\angle$ in alt. segment)

$\angle CBA = \angle CAM = 75°$ ($\angle$ in alt. segment)

$\angle ACB = 180° - \angle CAB - \angle CBA = 40°$ ($\angle$ sum in Δ)

27. The answer is D.

Let x be $\angle AEC$.

$\angle BCF = \angle CAE + \angle AEC$ (ext. $\angle$ of Δ)

$\angle BCF = 35° + x$

$\angle CBF = \angle AEC$ (ext. $\angle$, cyclic quad.)

$\angle CBF = x$

$\angle BFC + \angle BCF + \angle CBF = 180°$ ($\angle$ sum of Δ)

$25° + 35° + x + x = 180°$

$x = 60°$

$\angle AEC = 60°$

28. The answer is C.

$\overset{\frown}{BD} = 2\overset{\frown}{AB}$

$\angle BCD = 2 \times \angle ACB$ (arcs prop. to $\angle$ at circumference)

$50° = 2 \times \angle ACB$

$\angle ACB = 25°$

$\angle ACB + \angle BCD + \angle ABC + \angle CBD = 180°$ (opp. $\angle$s, cyclic quad.)

$25° + 50° + \angle ABC + 60° = 180°$

$\angle ABC = 45°$

29. The answer is B.

Join DE.

$\angle CED = x$ (ext. $\angle$, cyclic quad.)

$\angle ADE = \angle CED + \angle DCE$ (ext. $\angle$ of Δ)

$\angle ADE = x + y$

30. The answer is C.

$\angle BDA + \angle CBD = \angle BCA$ (ext. $\angle$ of Δ)

$27° + \angle CBD = 49°$

$\angle CBD = 22°$

$\angle CAE = \angle CBD = 22°$ ($\angle$s in the same segment)

$\angle ABC = 90°$ ($\angle$ in semi-circle)

$\angle BAE + \angle CAE + \angle ABC + \angle BCA = 180°$ ($\angle$ sum of Δ)

$\angle BAE + 22° + 90° + 49° = 180°$

$\angle BAE = 19°$

31. The answer is C.

Since $AE//BF$ and $AB=EF$, $\angle BAE=\angle FEA$

$\angle EFB+\angle FEA=180°$ (int. $\angle$s, $AE//EF$)

$\angle EFB+\angle BAE=180°$

$\therefore ABFE$ is concyclic. (opp. $\angle$s supp.)

By intercept theorem, $BC=FG$

$\therefore AC=EG$

Since $AE//CG$ and $AC=EG$, $\angle CAE=\angle GEA$

$\angle EGC+\angle GEA=180°$ (int. $\angle$s, $AE//CG$)

$\angle EGC+\angle CAE=180°$

$\therefore ACGE$ is concyclic. (opp. $\angle$s supp.)

By intercept theorem, $CD=GH$

$\therefore BD=FH$

Since $BF//DH$ and $BD=FH$, $\angle DBF=\angle HFB$

$\angle FHD+\angle HFB=180°$ (int. $\angle$s, $BF//DH$)

$\angle FHD+\angle DBF=180°$

$\therefore BDHF$ is concyclic. (opp. $\angle$s supp.)

32. The answer is A.

33. The answer is C.

34. The answer is C.

$PA=PB$

$\sqrt{(x+2)^2+(y+4)^2}=\sqrt{(x-6)^2+(y-1)^2}$

$x^2+4x+4+y^2+8y+16=x^2-12x+36+y^2-2y+1$

$16x+10y-17=0$

35. The answer is C.

$AP \perp BP$

$$\frac{y-(-1)}{x-5} \times \frac{y-0}{x-9} = -1$$

$$\frac{y+1}{x-5} \times \frac{y}{x-9} = -1$$

$$\frac{y^2+y}{x^2-14x+45} = -1$$

$$y^2 + y = -x^2 + 14x - 45$$

$$x^2 + y^2 - 14x + y + 45 = 0$$

The equation is $x^2 + y^2 - 14x + y + 45 = 0$.

36. The answer is C.

The equation of L is $x = 3$.

The equation of locus of P is $x = 3 - 5$ or $x = 3 + 5 \Rightarrow x = -2$ or $x = 8$.

37. The answer is C.

The number can be formed $= 4 \times 4 \times 4 \times 4 = 256$

38. The answer is A.

The number can be formed $= 4 \times 4 \times 3 \times 2 = 96$

39. The answer is C.

Number of words can be formed $= \dfrac{12!}{2!} = 239500800$

40. The answer is B.

Number of ways $= \dfrac{17!}{3!6!8!} = 2042040$

41. The answer is B.

Number of ways $= 6!2! = 1440$

42. The answer is B.

Number of combinations $= C_4^8 = 70$

43. The answer is B.

Number of combinations $= C_3^5 C_3^{13} C_1^2 = 5720$

44. The answer is C.

Number of combinations $= C_3^5 C_4^{15} = 13650$

45. The answer is C.

Maximum number of intersection points $= C_4^{40} = 91390$

Paper II (Set 2) Suggested solution

1.A	**6.D**	**11.A**	**16.B**	**21.A**	**26.B**	**31.A**	**36.B**	**41.C**
2.C	**7.C**	**12.B**	**17.B**	**22.A**	**27.C**	**32.B**	**37.C**	**42.C**
3.B	**8.B**	**13.B**	**18.A**	**23.A**	**28.A**	**33.A**	**38.A**	**43.D**
4.D	**9.C**	**14.A**	**19.B**	**24.A**	**29.C**	**34.B**	**39.C**	**44.D**
5.C	**10.B**	**15.D**	**20.C**	**25.B**	**30.B**	**35.A**	**40.C**	**45.B**

1. The answer is A.

Centre of the circle $=\left(-\frac{12}{2},\ -\frac{8}{2}\right)=(-6,\ -4)$

II is incorrect.

Radius of the circle $=\sqrt{\left(\frac{12}{2}\right)^2+\left(\frac{8}{2}\right)^2-27}=5$

III is correct.

A suggested point of the circumference $=(-6,\ -4+5)=(-6,\ 1)$.

It lies in the quadrant II.
The whole circle does not lie within the quadrant III.
I is incorrect.

2. The answer is C.

Centre of the circle $= \left(\frac{7+1}{2},\ \frac{5-3}{2} \right) = (4,\ 1)$

Radius of the circle $= \frac{1}{2}\sqrt{(7-1)^2 + [5-(-3)]^2} = 5$

The equation of the circle:

$$(x-4)^2 + (y-1)^2 = 5^2$$
$$x^2 - 8x + 16 + y^2 - 2y + 1 = 25$$
$$x^2 + y^2 - 8x - 2y - 8 = 0$$

3. The answer is B.

$$\left(\frac{8}{2}\right)^2 + \left(\frac{14}{2}\right)^2 - F > 0$$
$$4^2 + 7^2 - F > 0$$
$$F < 65$$

4. The answer is D.

$x^2 + y^2 - 4x - 2y - 15 = 0$

Centre $= (2,\ 1)$

$\frac{6+x}{2} = 2$

$x = -2$

$\frac{3+y}{2} = 1$

$y = -1$

$\therefore PQ = (-2, -1)$

5. The answer is C.

$$\text{Centre} = \left(\frac{p}{2},\ \frac{q}{2}\right),\ \text{Radius} = \frac{\sqrt{p^2+q^2}}{2}$$

$$\text{For } (0,\ 0),\ \text{Distance from centre} = \sqrt{\left(\frac{p}{2}-0\right)^2+\left(\frac{q}{2}-0\right)^2} = \frac{\sqrt{p^2+q^2}}{2}$$

$$\text{For } (p,\ q),\ \text{Distance from centre} = \sqrt{\left(p-\frac{p}{2}\right)^2+\left(q-\frac{q}{2}\right)^2} = \frac{\sqrt{p^2+q^2}}{2}$$

$$\text{For } \left(\frac{p}{2},\ \frac{q}{2}\right),\ \text{Distance from centre} = \sqrt{\left(\frac{p}{2}-\frac{p}{2}\right)^2+\left(\frac{q}{2}-\frac{q}{2}\right)^2} = 0$$

$\therefore$ Both $(0,\ 0)$ and $(p,\ q)$ lies on the circle

6. The answer is D.

$$\text{Centre} = \left(-\frac{-2}{2}, -\frac{4}{2}\right) = (1, -2)$$

The required equation:

$$\frac{y-1}{x-2} = \frac{1-(-2)}{2-1}$$

$$y-1 = 3(x-2)$$

$$3x-y-5=0$$

7. The answer is C.

Let the equation of tangent be $y = mx + c$.

Since the tangent passes through $(0, -2)$, the y-intercept is -2.

Equation of tangent : $y = mx - 2$

The intersection points of the tangent and the circle can be found by

$$\begin{cases} y = mx - 2 \text{..(1)} \\ x^2 + y^2 - 6x + 2y + 9 = 0 \text{..........................(2)} \end{cases}$$

Put (1) into (2),

$x^2 + (mx-2)^2 - 6x + 2(mx-2) + 9 = 0$

$x^2 + m^2x^2 - 4mx + 4 - 6x + 2mx - 4 + 9 = 0$

$(m^2+1)x^2 - (2m+6)x + 9 = 0$

The tangent and the circle will only have 1 intersection point.

$\therefore \Delta = 0$

$[-(2m+6)]^2 - 4(m^2+1)(9) = 0$

$4m^2 + 24m + 36 - 36m^2 - 36 = 0$

$32m^2 - 24m = 0$

$m(32m - 24) = 0$

$m = 0$ or $\dfrac{3}{4}$

$\therefore$ Equation of tangent: $y = -2$ or $y = \dfrac{3}{4}x - 2$

8. The answer is B.

Centre of $C_1 = (-\dfrac{-6}{2}, -\dfrac{4}{2}) = (3, -2)$

Radius of $C_1 = \sqrt{\left(\dfrac{-6}{2}\right)^2 + \left(\dfrac{4}{2}\right)^2 - 4} = 3$

Centre of $C_2 = (6,\ 2)$

Radius of $C_2 = \sqrt{64} = 8$

Distance between the centre of C_1 and $C_2 = \sqrt{(6-3)^2 + [2-(-2)]^2} = 5$

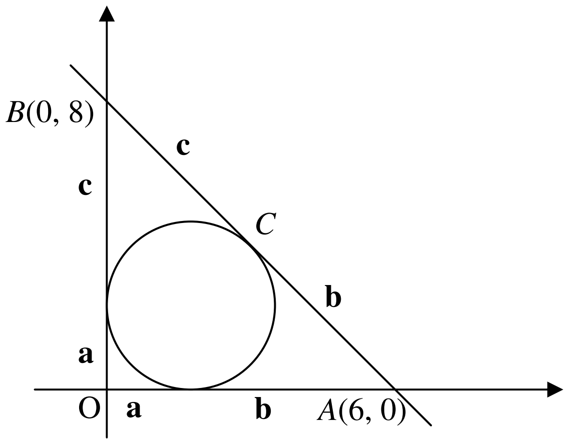
Since $8 - 3 = 5$, the answer is B.

9. The answer is C.

$a+c=8......(1)$

$a+b=6......(2)$

$b+c=\sqrt{(0-6)^2+(8-0)^2}=\sqrt{100}=10......(3)$



Solving (1), (2) and (3)

$a=2,\ b=4,\ c=6$

$BC:CA=3:2$

Let $C(x, y)$

$$C=(\frac{3(6)+2(0)}{3+2},\frac{3(0)+2(8)}{3+2})$$

$$C=(\frac{18}{5},\ \frac{16}{5})$$

10. The answer is B.

The favorable outcomes are as follow:

Sum	Outcome
3	(1, 2), (2, 1)
6	(1, 5), (2, 4), (4, 2), (5, 1)
9	(1, 8), (2, 7), (3, 6), (4, 5), (5, 4), (6, 3), (7, 2), (8, 1)
12	(4, 8), (5, 7), (7, 5), (8, 4)
15	(7, 8), (8, 7)

The total number of possible outcomes is (8)(7) = 56

Hence the required probability

$$=\frac{2+4+8+4+2}{56}$$

$$=\underline{\underline{\frac{5}{14}}}$$

11. The answer is A.

The sample spaces are:

(1,1),(1,2),(1,3),(1,5),(2,1),(2,2),(2,3),(2,5),

(3,1),(3,2),(3,3),(3,5),(5,1),(5,2),(5,3),(5,5)

$\because$ only (2,3) and (3,2) have sum equal to 5

$$\therefore P(E)=\frac{2}{16}=\frac{1}{8}$$

12. The answer is B.

The favorable outcomes are:

(1,2),(1,4),(2,1),(2,3),(3,2),(3,4),(4,1),(4,3)

The number of possible outcomes are:

$4 \times 3 = 12$

Therefore, the required probability:

$\frac{8}{12} = \frac{2}{3}$

13. The answer is B.

Number of possible outcome is $6 \times 6 = 36$

Favourable outcome:

(1,2) (1,3) (1,4) (1,5) (1,6) (2,3) (2,4) (2,5) (2,6) (3,4)

(3,5) (3,6) (4,5) (4,6) (5,6)

Therefore, the required probability

$= \frac{15}{36}$

$= \frac{5}{12}$

14. The answer is A.

Probability of an event should have a value between 1 and 0.

15. The answer is D.

Favourable outcome:

(1,1,1), (1,1,2), (1,2,1), (2,1,1), (1,1,3), (1,3,1), (3,1,1),

(1,2,2), (2,1,2), (2,2,1)

Number of possible outcome:

$6 \times 6 \times 6 = 216$

The required probability

$= \frac{10}{216}$

$= \frac{5}{108}$

16. The answer is B.

The probability of only one bomb can be found

= The first box has bomb and the second box doesn't have bomb OR

The first box doesn't have bomb and the second box has bomb

$=\frac{2}{8}\times\frac{6}{7}+\frac{6}{8}\times\frac{2}{7}$

$=\frac{3}{7}$

17. The answer is B.

After A choosing a seat, B can choose one of the four seats.

The probability of A sitting next to B

After A choosing a seat, B can only choose one of the remaining four seats.

Therefore, the probability of A sitting next to B is $\frac{2}{4}=\frac{1}{2}$

18. The answer is A.

$z=\frac{kx}{y^2}$ where k is a constant

$8=\frac{k(2)}{2^2}$

$k=16$

$\therefore z=\frac{16x}{y^2}$

When $x=y=4$,

$z=\frac{16(4)}{4^2}=4$

19. The answer is B.

$p=kqr^2$ where k is a constant

$54=k(2)(3)^2$

$k=3$

$\therefore p=3qr^2$

When $q=3$ and $r=2$,

$p=3(3)(2)^2=36$

20. The answer is C.

$z = \frac{kx^2}{y}$ where k is a constant

$16 = \frac{k(4)^2}{3}$

$k = 3$

$\therefore z = \frac{3x^2}{y}$

When $x = 2$ and $z = 3$,

$3 = \frac{3(2)^2}{y}$

$y = 4$

21. The answer is A.

$y = k_1 x + k_2\sqrt{x}$ where k_1 and k_2 are constant

$3 = k_1(1) + k_2\sqrt{1}$

$k_1 + k_2 = 3$.....................(1)

$8 = k_1(4) + k_2\sqrt{4}$

$4k_1 + 2k_2 = 8$

$2k_1 + k_2 = 4$...................(2)

By solving (1) and (2), $k_1 = 1$ and $k_2 = 2$

$\therefore y = x + 2\sqrt{x}$

When $x = 9$,

$y = 9 + 2\sqrt{9} = 15$

22. The answer is A.

$y = k_1 x + k_2 x^2$ where k_1 and k_2 are constant

$3 = k_1(1) + k_2(1)^2$

$k_1 + k_2 = 3$.....................(1)

$8 = k_1(4) + k_2(4)^2$

$4k_1 + 16k_2 = 8$

$k_1 + 4k_2 = 2$..................(2)

By solving (1) and (2), $k_1 = \frac{10}{3}$ and $k_2 = -\frac{1}{3}$

$\therefore y = \frac{10}{3}x - \frac{1}{3}x^2$

When $x = 9$,

$y = \frac{10}{3}(9) - \frac{1}{3}(9)^2 = 3$

23. The answer is A.

$x = \frac{k}{\sqrt{y}}$ where k is a constant

If y is decreased by 40%,

$x_1 = \frac{k}{\sqrt{(1-40\%)y}} = \frac{k}{\sqrt{0.6y}} = \frac{1.2910k}{\sqrt{y}} = 1.2910x$

x will increase 29.1%

24. The answer is A.

$x = ky^3$ where k is a constant

$y = \sqrt[3]{\frac{x}{k}}$

If x is increased by 2%,

$y_1 = \sqrt[3]{\frac{(1+2\%)x}{k}} = \sqrt[3]{\frac{1.02x}{k}} = 1.00662\sqrt[3]{\frac{x}{k}} = 1.00662y$

$\therefore y$ will increase 0.662%

25. The answer is B.

$y = \frac{k}{x}$ where k is a constant

$\therefore xy = k$

26. The answer is B.

$$\text{Median} = \text{The } \left(\frac{8+1}{2}\right)^{th} \text{ Term} = \text{The } 4.5^{th} \text{ Term} = \frac{4+6}{2} = 5$$

27. The answer is C.

Standard deviation measures the dispersion of the data.

There are more data in the two sides of the graph of the group C.

$\therefore$ The Standard deviation of C is the largest.

28. The answer is A.

The mode of B is on the right side of the mode of A.

The mode of B is larger.

$\therefore$ I is false.

There are more data in the two sides of B.

The Standard Deviation and Inter-quartile Range of B is larger.

$\therefore$ II is true and III is false.

29. The answer is C.

The Inter-quartile Range

$= 175 - 155$

$= 20$

30. The answer is B.

$$\frac{150(7)+200(8)+250(x)+300(10)}{7+8+x+10} = 230$$

$5650 + 250x = 5750 + 230x$

$20x = 100$

$x = 5$

31. The answer is A.

The new standard deviation

$= \$2800(1+15\%)$

$= \$3220$

32. The answer is B.

The mean of the five numbers

$$= \frac{(a-6)+(a-3)+a+(a+3)+(a+6)}{5}$$

$$= a$$

The standard deviation

$$= \sqrt{\frac{(a-6-a)^2+(a-3-a)^2+(a-a)^2+(a+3-a)^2+(a+6-a)^2}{5}}$$

$$= \sqrt{\frac{(-6)^2+(-3)^2+0^2+3^2+6^2}{5}}$$

$$= \sqrt{18}$$

$$= 4.24$$

33. The answer is A.

The inter-quartile range

$$= \text{The } \left(\frac{3(11+1)}{4}\right)^{th} \text{ term} - \text{The } \left(\frac{11+1}{4}\right)^{th} \text{ term}$$

$$= \text{The } 9^{th} \text{ term} - \text{The } 3^{rd} \text{ term}$$

$$= 21 - 8$$

$$= 13$$

34. The answer is B.

$$\frac{AB}{\sin 60°} = \frac{4}{\sin(180° - 75° - 60°)}$$

$$AB = \frac{4\sin 60°}{\sin 45°} = \frac{4(\frac{\sqrt{3}}{2})}{\frac{\sqrt{2}}{2}} = \frac{4\sqrt{3}}{\sqrt{2}} = \frac{4\sqrt{3}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = 2\sqrt{6}$$

35. The answer is A.

$$\angle PRS = 90° - 25° = 65°$$

$$\angle PSR = 90° - 35° = 55°$$

$$\angle RPS = 180° - 65° - 55° = 60°$$

$$\frac{RS}{\sin 60°} = \frac{8}{\sin 65°}$$

$$RS = \frac{8\sin 60°}{\sin 65°}$$

36. The answer is B.

$$\cos \angle ABC = \frac{9^2 + 15^2 - 13^2}{2(9)(15)}$$

$$\cos \angle ABC = \frac{137}{270}$$

$$\angle ABC = \cos^{-1} \frac{137}{270} = 59.5087° \approx 60°$$

37. The answer is C.

$$6^2 = AB^2 + 5^2 - 2(AB)(5)\cos 60°$$

$$AB^2 - 5AB - 11 = 0$$

$$AB = \frac{-(-5) \pm \sqrt{(-5)^2 - 4(1)(-11)}}{2(1)} = \frac{5 \pm \sqrt{69}}{2}$$

$$AB = 6.6533 \text{ or } -1.6533 \text{ (Rejected)}$$

38. The answer is A.

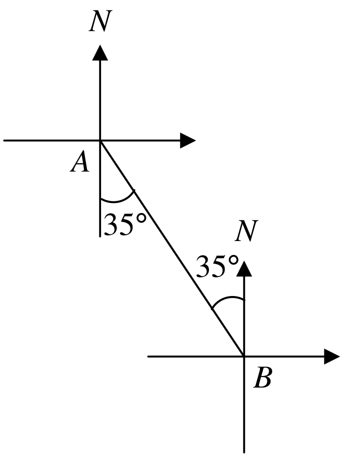
$$\text{Area of } \Delta ABC = \frac{1}{2}(12)(6)\sin 30° = 18 \text{ cm}^2$$

39. The answer is C.

$$s = \frac{18 + 13 + 25}{2} = 28$$

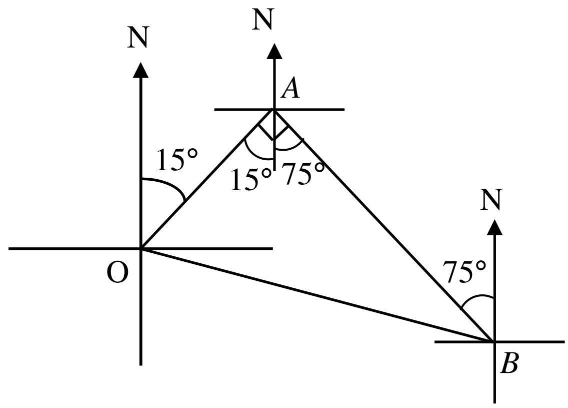
$$\text{Area of } \Delta ABC = \sqrt{28(28-13)(28-18)(28-25)} = \sqrt{12600} = 30\sqrt{14} \text{ cm}^2$$

40. The answer is C.



41. The answer is C.

The bearing of A from $B = 360° - 75° = 285°$



42. The answer is C.

Let a be the first term and r be the common ratio.

$ar = -6$....................(1)

$ar^4 = 162$.................(2)

$\frac{(2)}{(1)}$: $r^3 = \frac{162}{-6} = -27$

$r = -3$

Put $r = -3$ into (1),

$a(-3) = -6$

$a = 2$

The first term is 2.

43. The answer is D.

Let r be the common ratio.

$$\frac{1}{1-r} = k$$

$$1 - r = \frac{1}{k}$$

$$r = 1 - \frac{1}{k}$$

$$r = \frac{k-1}{k}$$

44. The answer is D.

Let m be the common difference.

$b-a=c-b=d-c=m$

I is false because m can be negative.

If m is positive, $a<b<c<d$.

$a+b<c+d$

$\therefore$ II is false.

$\frac{1}{b}-\frac{1}{a}=\frac{a-b}{ab}=\frac{-m}{ab}$

$\frac{1}{c}-\frac{1}{b}=\frac{b-c}{bc}=\frac{-m}{bc}\neq\frac{1}{b}-\frac{1}{a}$

$\therefore$ III is false.

45. The answer is B.

$\frac{b}{10}=\frac{10}{a}$

$ab=100$

$\log a+\log b=\log ab=\log 100=2$