Set 1 – Full Solution

Paper 2

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

1. D

$\frac{(3y^2)^4}{9y}$

$= \frac{3^4 y^{2\times 4}}{3^2 y}$

$= 3^{4-2}y^{8-1}$

$= 3^2 y^7$

$= 9y^7$

2. B

$4a = \frac{1}{5}(2c - 3ab)$

$20a = 2c - 3ab$

$3ab + 20a = 2c$

$a(3b + 20) = 2c$

$a = \frac{2c}{3b+20}$

3. C

$ad - ae - bd + be + cd - ce$

$= ad - bd + cd - ae + be - ce$

$= d(a - b + c) - e(a - b + c)$

$= (a - b + c)(d - e)$

4. C

Method 1

$2(x^2 + 2a) \equiv (x + 3)(2x + b) + 6$

$2x^2 + 4a \equiv 2x^2 + 6x + bx + 3b + 6$

$2x^2 + 4a \equiv 2x^2 + (6 + b)x + (3b + 6)$

Comparing the coefficients of like terms,

$0 = 6 + b$

$b = -6$

$4a = 3(-6) + 6$

$a = -3$

Method 2

When $x = -3$,

$2[(-3)^2 + 2a] = 6$

$a = -3$

5. B

f(x) is divisible by $x - 1$.

$\therefore$ f(1) $= 1 + k^2 - 6k + 8 = 0$

$k^2 - 6k + 9 = 0$

$k = 3$

$\therefore$ f(x) $= x^5 + 9x^3 - 18x + 8$

f(-2) $= -60$

6. A

A ✓ $0.08306 = 0.1$ (correct to 1 decimal place)

B ✗ $0.08306 = 0.083$ (correct to 2 significant figures)

C ✗ $0.08306 = 0.0831$ (correct to 3 significant figures)

D ✗ $0.08306 = 0.0831$ (correct to 4 decimal places)

7. C

$(x - 2s - 2)^2 = 9(s + 1)^2$

$x - 2s - 2 = 3(s + 1)$ or $x - 2s - 2 = -3(s + 1)$

$x = 5s + 5$ or $x = -s - 1$

8. B

I. ✓ The graph opens downwards.

II. ✓ The vertex of graph lies on the left of the y-axis.

III. ✗ The vertex of graph lies above the x-axis.

9. C

$2x - 7 > 3x + 2$

$-x > 9$

$x < -9$

$-3x + 5 > -4$

$-3x > -9$

$x < 3$

$\therefore$ Combining, $x < 3$.

10. B

Let \$$x$ and \$$y$ be the price of one pen and the price of one pencil respectively.

The price of one notebook would then be \$($x + y$).

$2y = (1 + 12.5\%)x$

$y = \frac{9}{16}x$

The price of one notebook $= \$\left(x + \frac{9}{16}x\right) = \$\left(\frac{25}{16}x\right)$

The price of one notebook is $\frac{\frac{25}{16}x - x}{x} \times 100\% = 56.25\%$ higher than the price of one pen.

11. B

The amount

$= 7000 \times \left(1 + \frac{0.09}{4}\right)^4$

$= \$7651.583232$

The interest

$= \$7651.583232 - \$7000$

$= \$651.583232$

$= \$652$

12. D

$(j+k):(i+k)$

$=\left(3i+\frac{6i}{8}\right):\left(i+\frac{6i}{8}\right)$

$=\frac{15}{4}i:\frac{7}{4}i$

$=15:7$

13. A

The actual area of the reservoir

$=188\times 20000^2$

$=7.52\times 10^{10}\text{ cm}^2$

$=7.52\times 10^{6}\text{ m}^2$

$=7.52\text{ km}^2$

14. C

The nth pattern has $1+3+5+\ldots+(2n-1)$ dots.

The number of dots in the 11th pattern $=1+3+5+\ldots+21=121$

15. C

Let $z=k_1x^2+\frac{k_2}{y^3}$, where k_1 and k_2 are non-zero constants.

$$\begin{cases}-62=k_1(2)^2+\frac{k_2}{1^3}\\ 24=k_1(8)^2+\frac{k_2}{2^3}\end{cases}$$

Solving, we have $k_1=\frac{1}{2}$, $k_2=-64$.

$\therefore\ \frac{1}{2}(2)^2-\frac{64}{(-4)^3}=3$

16. B

$\frac{16350}{84}=194.64\text{ mL}$

$\therefore$ The minimum volume of orange juice $=194.64$ mL

17. C

Method 1

Let O be the centre of the circle $ABCD$; and M be the mid-point of AB.

$OM\perp AB$

$\sin\angle AOM=\frac{AM}{AO}=\frac{3}{4}$

$\angle AOB=2\angle AOM=2\sin^{-1}\frac{3}{4}$

$OM^2=OA^2-AM^2=4^2-3^2$

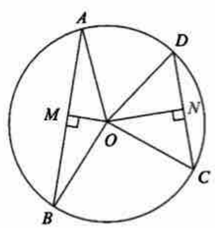
$OM=\sqrt{7}$

The area of $\Delta OAB=\frac{1}{2}AB\times OM=\frac{1}{2}(6)(\sqrt{7})=3\sqrt{7}$

The area of the sector $OAB=\pi(4)^2\frac{2\sin^{-1}\frac{3}{4}}{360°}\approx 13.5690$

$OD=OC=4=CD$

$\therefore\ \angle COD=60°$



Let N be the mid-point of CD.

$ON\perp CD$

$ON^2=OD^2-DN^2=4^2-2^2$

$ON=2\sqrt{3}$

The area of $\Delta OCD=\frac{1}{2}CD\times ON=\frac{1}{2}(4)(2\sqrt{3})=4\sqrt{3}$

The area of the sector $OCD=\pi(4)^2\frac{60°}{360°}=\frac{8}{3}\pi$

The area of the shaded region

= Area of the circle – Area of the sector OAB + Area of ΔOAB – Area of the sector OCD + Area of ΔOCD

$\approx\pi(4)^2-13.5690+3\sqrt{7}-\frac{8}{3}\pi+4\sqrt{3}$

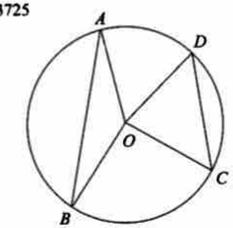
$=43.2\text{ cm}^2$ (corr. to 3 sig. fig.)

Method 2

Let O be the centre of the circle $ABCD$.

In ΔOAB, by cosine formula, $\cos\angle AOB=\frac{OA^2+OB^2-AB^2}{2(OA)(OB)}=\frac{4^2+4^2-6^2}{2(4)(4)}=\frac{-1}{8}$.

The area of $\Delta OAB=\frac{1}{2}(OA)(OB)\sin\angle AOB=\frac{1}{2}(4)(4)\sin\left(\cos^{-1}\frac{-1}{8}\right)\approx 7.93725$



The area of the sector $OAB=\pi(4)^2\frac{\cos^{-1}\frac{-1}{8}}{360°}\approx 13.5690$

$OD=OC=4=CD$

$\therefore\ \angle COD=60°$

The area of $\Delta OCD=\frac{1}{2}(OC)(OD)\sin\angle COD=\frac{1}{2}(4)(4)\sin 60°=4\sqrt{3}$

The area of the sector $OCD=\pi(4)^2\frac{60°}{360°}=\frac{8}{3}\pi$

The area of the shaded region

= Area of the circle – Area of the sector OAB + Area of ΔOAB – Area of the sector OCD + Area of ΔOCD

$\approx\pi(4)^2-13.5690+7.93725-\frac{8}{3}\pi+4\sqrt{3}$

$=43.2\text{ cm}^2$ (corr. to 3 sig. fig.)

18. C

Method 1

Produce BE and AD to meet at F.

Since $BC\,//\,AF$, $\Delta BCE\sim\Delta FDE$ (AAA).

$BE:FE=BC:FD=CE:DE=3:1$ (corr. sides, ~ Δs)

As $BE:EF=3:1$, Area of ΔABE : Area of $\Delta AEF=3:1$.

The area of $\Delta AEF=2\text{ cm}^2$

As $BC:FD=3:1$, and $BC:AD=2:1$, $AD:DF=3:2$.

Area of ΔADE : Area of $\Delta FDE=3:2$

Area of ΔADE + Area of ΔFDE = Area of $\Delta AEF=2\text{ cm}^2$

$\therefore$ The area of $\Delta ADE=2\times\frac{3}{2+3}=1.2\text{ cm}^2$

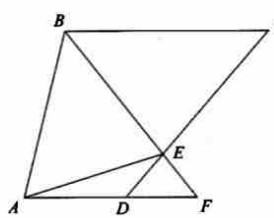
The area of $\Delta FDE=2-1.2=0.8\text{ cm}^2$

Since $\Delta BCE\sim\Delta FDE$ with side ratio $3:1$,

Area of ΔBCE : Area of $\Delta FDE=3^2:1^2=9:1$.

The area of $\Delta BCE=9(0.8)=7.2\text{ cm}^2$

The area of the trapezium $ABCD=6+1.2+7.2=14.4\text{ cm}^2$



Method 2

Produce BA and CD to meet at G.

Since $BC \parallel AD$, $\Delta BCG \sim \Delta ADG$ (AAA).

$CG : DG = BG : AG = BC : AD = 2 : 1$ (corr. sides, ~ Δs)

$\therefore AB = AG$ and $CD = DG$

Area of ΔAEG = Area of $\Delta ABE = 6 \text{ cm}^2$

Since $CD = DG$ and $CE : DE = 3 : 1$,

$GD : DE : EC = 4 : 1 : 3$, $CG : EG = 8 : 5$.

Area of ΔGBC : Area of $\Delta BEG = 8 : 5$

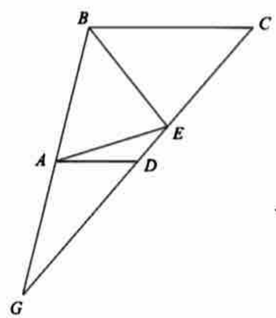
The area of $\Delta GBC = (6+6)\times\frac{8}{5} = 19.2 \text{ cm}^2$

Since $\Delta BCG \sim \Delta ADG$ with side ratio 2 : 1,

Area of ΔBCG : Area of $\Delta ADG = 2^2 : 1^2 = 4 : 1$.

The area of $\Delta ADG = 19.2\times\frac{1}{4} = 4.8 \text{ cm}^2$

The area of trapezium $ABCD = 19.2 - 4.8 = 14.4 \text{ cm}^2$



19. B

Let h be the height of the cone.

$4\pi r^2 = \pi r\sqrt{r^2+h^2}$

$4r = \sqrt{r^2+h^2}$

$16r^2 = r^2 + h^2$

$h^2 = 15r^2$

$h = \sqrt{15}r$

$\therefore$ The volume of the cone $= \frac{1}{3}\pi r^2 h = \frac{1}{3}\pi r^2(\sqrt{15}r) = \frac{\sqrt{15}}{3}\pi r^3$

20. D

I. ✓

$\tan(180° - \theta) = -\tan\theta$

$\therefore \tan\theta + \tan(180° - \theta) = \tan\theta - \tan\theta = 0$

II. ✓

$\sin x > 0$ for $0° < x < 180°$.

$\therefore \sin\theta > 0$

Since $60° < (150° - \theta) < 150°$,

$\therefore \sin(150° - \theta) > 0$

$\frac{\sin\theta}{\sin(150° - \theta)} > 0$

III. ✓

$\cos x < 0$ for $90° < x < 270°$.

Since $120° < (\theta + 120°) < 210°$,

$\therefore \cos(\theta + 120°) < 0$

$\cos x > 0$ for $-90° < x < 90°$.

Since $-90° < (\theta - 90°) < 0°$

$\therefore \cos(\theta - 90°) > 0$

$\cos(\theta + 120°) - \cos(\theta - 90°) < 0$

21. A

$\angle BAD = \angle BDA = 47°$ (base ∠s, isos. Δ)

$\angle DAC = \angle BDA - \angle DCA$ (ext. ∠ of Δ)

$= 47° - 26°$

$= 21°$

$\angle ABE = \angle BAC$ (alt. ∠s, $EB \parallel AC$)

$= 47° + 21°$

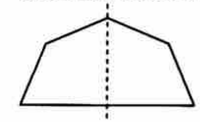
$= 68°$

22. D

I. ✓ The sum of the interior angles $= 180° \times (5-2) = 540°$

II. ✓ The sum of the exterior angles of a polygon is 360°.

III. ✓



23. B

$OB = OC$

$\therefore \angle OCB = \frac{180° - 36°}{2} = 72°$

$\angle BAC = 18°$ (∠ at centre twice ∠ at circumference)

$\angle BCA = 2 \times \angle BAC = 36°$ (arcs prop. to ∠s at circumference)

$\therefore \angle OCA = 72° - 36° = 36°$

24. C

12 pentagons have $12 \times 5 = 60$ sides.

20 hexagons have $20 \times 6 = 120$ sides.

Each edge is the side of two faces, so there are $\frac{60+120}{2} = 90$ edges.

By Euler's formula, $V + F - E = 2$.

$V = 2 - 32 + 90 = 60$

$\therefore$ The polyhedron has 90 edges and 60 vertices.

25. B

The coordinates of B are (6, 7).

The coordinates of the reflection image of B with respect to the y-axis are (–6, 7).

26. D

The slope of $L_1 = \tan 135° = -1$

The equation of L_1 is

$y = -x + 5$ …… (1)

The equation of L_2 is

$\frac{x}{-3} + \frac{y}{1} = 1$

$y = \frac{x}{3} + 1$ …… (2)

Solving, we have $x = 3$ and $y = 2$.

27. A

The coordinates of the centre are $(-h, -k)$.

From the figure,

I. ✓

$-h > 0$

$\therefore h < 0$

$-k < 0$

$\therefore k > 0$

$hk < 0$

II. ✓

The x-coordinate of the centre $< r$

$-h < r$

$h > -r$

III. ✗

The y-coordinate of the centre $< -r$

$-k < -r$

$k > r$

28. D

I. ✗

Since the range is 10, $4 \le p \le 14$ and $4 \le q \le 14$.

Since the median is 7, one is smaller than or equal to 7 and another is greater than or equal to 7.

Since $p < q$, $4 \le p \le 7$.

p can be equal to 4.

II. ✓

Since $p < q$, $4 \le p \le 7$ and $7 \le q \le 14$.

III. ✓

If mean = 7.8 and $q = 7$, then $p = 7$. It is impossible.

29. B

I. ✗ 40 is the median, the mean cannot be determined from the diagram.

II. ✗ The inter-quartile range is 20 lessons/15 hours.

III. ✓ 54 hours is longer than the duration of 70 lessons.

30. B

The standard deviation $\approx 1.40248 \approx 1.40$

31. B

$m^2 - 16 = (m + 4)(m - 4)$

$m^2 + 8m + 16 = (m + 4)^2$

$m^3 - 64 = (m - 4)(m^2 + 4m + 16)$

$\therefore$ The L.C.M. $= (m + 4)^2(m - 4)(m^2 + 4m + 16)$

32. A

Method 1

Since the graph is downward sloping, $0 < a < 1$.

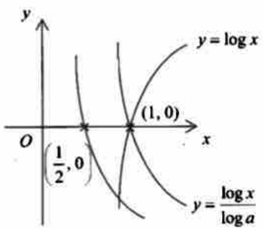
Put $x = 1$. $y = \log_a(1) + b = b$

Note that when $x > \frac{1}{2}$, $y < 0$.

$\therefore b < 0$

Method 2

$y = \log_a x + b = \dfrac{\log x}{\log a} + b$



Consider the graph of $y = \log x$ in the figure.

Since the graphs are in opposite direction, $\dfrac{1}{\log a}$ is negative.

$\therefore \log a$ is negative, so $0 < a < 1$.

Consider the graph of $y = \dfrac{\log x}{\log a}$ in the figure.

For $y = 0$, $x = 1$. So it still passes through the point $(1, 0)$.

However, for $y = \dfrac{\log x}{\log a} + b$, it passes through the point $\left(\frac{1}{2}, 0\right)$,

so the graph is shifted downwards.

$\therefore b < 0$

33. A

10001100011_2

$= 2^{10} + 2^6 + 2^5 + 2 + 1$

$= 2^{10} + 99$

34. B

Method 1

$\alpha + \beta = -6$ and $\alpha\beta = 12$

$\alpha^4 + \beta^4$

$= \alpha^4 + 2\alpha^2\beta^2 + \beta^4 - 2\alpha^2\beta^2$

$= (\alpha^2 + \beta^2)^2 - 2\alpha^2\beta^2$

$= (\alpha^2 + 2\alpha\beta + \beta^2 - 2\alpha\beta)^2 - 2\alpha^2\beta^2$

$= [(\alpha + \beta)^2 - 2\alpha\beta]^2 - 2(\alpha\beta)^2$

$= [(-6)^2 - 2(12)]^2 - 2(12)^2$

$= -144$

Method 2

$\alpha + \beta = -6$

$x^2 + 6x + 12 = 0$

$\alpha^2 = -6\alpha - 12$ and $\beta^2 = -6\beta - 12$

$\alpha^4 = (-6\alpha - 12)^2 = 36(\alpha^2 + 4\alpha + 4) = 36(-6\alpha - 12 + 4\alpha + 4) = 36(-2\alpha - 8) = -72(\alpha + 4)$

Similarly, $\beta^4 = -72(\beta + 4)$.

$\therefore \alpha^4 + \beta^4 = [-72(\alpha + 4)] + [-72(\beta + 4)] = -72(\alpha + \beta + 8) = -72(-6 + 8) = -144$

35. D

$\dfrac{2i - \alpha}{3i - 1}$

$= \dfrac{2i - \alpha}{3i - 1} \times \dfrac{-3i - 1}{-3i - 1}$

$= \dfrac{6 - 2i + 3\alpha i + \alpha}{9 + 1}$

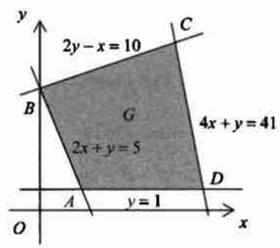
$= \dfrac{6 + \alpha}{10} + \dfrac{3\alpha - 2}{10} i$

36. D

$f(x) = g(x)$
$-x^2 + bx + c = mx + c$
$x^2 + (m - b)x = 0$
Let α and β be the roots of the equation $x^2 + (m - b)x = 0$.
$\alpha + \beta = -(m - b) = b - m$
$\alpha\beta = 0$
The distance between A and B
$= \sqrt{(\alpha-\beta)^2 + [(m\alpha + c) - (m\beta + c)]^2}$
$= \sqrt{(\alpha-\beta)^2 + m^2(\alpha-\beta)^2}$
$= \sqrt{(1+m^2)(\alpha-\beta)^2}$
$= \sqrt{(1+m^2)[(\alpha+\beta)^2 - 4\alpha\beta]}$
$= \sqrt{(1+m^2)(b-m)^2}$
$= (m-b)\sqrt{1+m^2}$ or $-(m-b)\sqrt{1+m^2}$ (rejected)

37. C

With the illustration of the graph on the right,
G is the shaded region, with vertices A, B, C and D.
After solving the equations, the coordinates of A, B, C and D are (2, 1), (0, 5), (8, 9) and (10, 1) respectively.
The value of $75 - 4x - 3y$ at A, B, C and D are 64, 60, 16 and 32 respectively.
$\therefore$ The maximum value of $75 - 4x - 3y$ is 64.



38. D

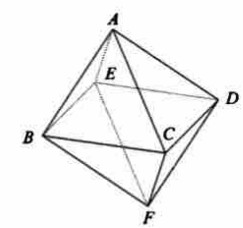
The nth term
= Sum of the first nth terms − Sum of the first $(n-1)$th terms
$= 2n(n-9) - 2(n-1)(n-1-9)$
$= 2(n^2 - 9n) - 2(n^2 - 11n + 10)$
$= 4n - 20$
I. ✗
$4n - 20 < 0$
$n < 5$
$\therefore$ Only the first 4 terms are negative.
Sum of all negative terms $= 2(4)(4-9) = -40$
II. ✓
The 2nd term $= 4(2) - 20 = -12$
The 9th term $= 4(9) - 20 = 16$
$16 - (-12) = 28$
III. ✓
The nth term $= 4n - 20 = 4(n-5)$
Since n is an integer, $n - 5$ is also an integer.
$\therefore$ All terms are divisible by 4.

39. C

The graph is sinusoidal.
Let the equation be $y = a\sin(hx° + k) + b$.
Since the amplitude is 2, $a = 2$.
The range of y is from −3 to 1, where the range of $y = 2\sin(x°)$ is from −2 to 2.
Thus, the graph is shifted downwards by 1 unit.
$b = -1$
When $x = 0$ or $x = 1440$, $y = 0$.
$0 = 2\sin(k) - 1$
$\sin k = 0.5$
From the choices, $k = 30°$.
$0 = 2\sin(1440h° + 30°) - 1$
$\sin(1440h° + 30°) = 0.5$
$1440h° + 30° = 30°$ or $150°$ or $390°$ or $510°$ or $750°$ or …
$1440h° = 0°$ or $120°$ or $360°$ or $480°$ or $720°$ or …
$h = 0$ (rejected) or $\frac{1}{12}$ or $\frac{1}{4}$ or $\frac{1}{3}$ or $\frac{1}{2}$ or …
Since there are three x-intercepts within $0 < x \le 1440$, the third root of h should be chosen.
$\therefore\ h = \frac{1}{3}$
Thus, the graph can represent the equation $y = 2\sin\left(\frac{x°}{3} + 30°\right) - 1$.

40. D

I. ✓
$BCDE$ is a square.
$BD = \sqrt{1^2 + 1^2} = \sqrt{2}$ cm
ΔABC is equilateral.
Let M be a point on AC such that $BM \perp AC$.
$BM = BC\sin 60° = \frac{\sqrt{3}}{2}$ cm
By symmetry, $DM = \frac{\sqrt{3}}{2}$ cm.
By cosine formula,
$$\cos\angle BMD = \frac{\left(\frac{\sqrt{3}}{2}\right)^2 + \left(\frac{\sqrt{3}}{2}\right)^2 - (\sqrt{2})^2}{2\left(\frac{\sqrt{3}}{2}\right)\left(\frac{\sqrt{3}}{2}\right)} = -\frac{1}{3}$$



The angle between the plane ABC and the plane $ADC = \angle BMD = \cos^{-1}\left(-\frac{1}{3}\right)$

II. ✓
The surface area of the octahedron
$= 8 \times$ Area of ΔABC
$= 8\left[\frac{1}{2}(1)(1)\sin 60°\right]$
$= 2\sqrt{3}$ cm^2

III. ✓

By symmetry, $AF = BD = \sqrt{2}$ cm.

Let P be the intersection point of AF and the plane $BCDE$.

By symmetry, $AP \perp$ the plane $BCDE$ and $AP = \frac{1}{2}AF = \frac{\sqrt{2}}{2}$ cm.

By symmetry, the pyramid $ABCDE$ and the pyramid $FBCDE$ are congruent.

The volume of the octahedron

$= 2 \times$ Volume of pyramid $ABCDE$

$= 2 \times \left(\frac{1}{3} \times 1^2 \times \frac{\sqrt{2}}{2}\right)$

$= \frac{\sqrt{2}}{3}$ cm^3

41. B

Join AD, BC and CD.

$\angle FGH = 180° - 86° = 94°$ (opp. $\angle$s, cyclic quad.)

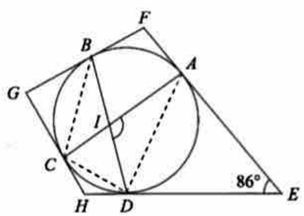
$AE = DE$ and $BG = CG$ (tangent properties)

$\angle ADE = \frac{180° - 86°}{2} = 47°$

$\angle BCG = \frac{180° - 94°}{2} = 43°$

$\angle ACD = 47°$ and $\angle BDC = 43°$ ($\angle$ in alt. segment)

$\angle AID = \angle ACD + \angle BDC = 47° + 43° = 90°$ (ext. $\angle$ of Δ)



42. B

A ✗

Put $y = 4x + 3$ into $x^2 + y^2 + x + 4y - 2 = 0$,

$x^2 + (4x+3)^2 + x + 4(4x+3) - 2 = 0$

$17x^2 + 41x + 19 = 0$

$\Delta = (41)^2 - 4(17)(19) = 389 > 0$

$\therefore$ The straight line and the circle intersect at two distinct points.

B ✓

Put $y = 4x + 3$ into $x^2 + y^2 - 4x + y + 2 = 0$,

$x^2 + (4x+3)^2 - 4x + (4x+3) + 2 = 0$

$17x^2 + 24x + 14 = 0$

$\Delta = (24)^2 - 4(17)(14) = -376 < 0$

$\therefore$ The straight line and the circle do not intersect.

C ✗

Put $y = 4x + 3$ into $x^2 + y^2 + 3x + 4y - 3 = 0$,

$x^2 + (4x+3)^2 + 3x + 4(4x+3) - 3 = 0$

$17x^2 + 43x + 18 = 0$

$\Delta = (43)^2 - 4(17)(18) = 625 > 0$

$\therefore$ The straight line and the circle intersect at two distinct points.

D ✗

Put $y = 4x + 3$ into $x^2 + y^2 + 4x - 7y + 12 = 0$,

$x^2 + (4x+3)^2 + 4x - 7(4x+3) + 12 = 0$

$17x^2 = 0$

$\Delta = (0)^2 - 4(17)(0) = 0$

$\therefore$ The straight line and the circle intersect at one point only.

43. B

The number of committees

$= C_5^{18+12} - C_5^{12} - C_5^{18}$

$= 133146$

44. C

Let x be John's score, z be John's standard score, μ be the mean and σ be the standard deviation.

$z = \frac{x - \mu}{\sigma}$

$\frac{196 - 136}{54} < z < \frac{200 - 119}{54}$

$1.11111 < z < 1.5$

45. D

By observation:

$2a + 2 = 2(a + 7) - 12$

$4b - 12 = 2(2b) - 12$

$2c - 22 = 2(c - 5) - 12$

$8 = 2(10) - 12$

Each of the original data is multiplied by 2 and then 12 is subtracted from it.

Therefore, the variance is multiplied by $2^2 = 4$.

The required variance $= 4(18) = 72$