

Suggested Solution for 2020 HKDSE Mathematics(core) Multiple Choice Questions

1. C

$$\frac{6x}{(3x^{-5})^{-2}}$$

$$= \frac{6x}{3^{-2}x^{10}}$$

$$= \frac{3^2 \cdot 6}{x^9}$$

$$= \frac{54}{x^9}$$

2. C

$$a(a + b) = 2(b - a)$$

$$a^2 + ab = 2b - 2a$$

$$2b - ab = a^2 + 2a$$

$$b(2 - a) = a^2 + 2a$$

$$b = \frac{a^2 + 2a}{2 - a}$$

3. A

$$\frac{5}{4k+3} - \frac{2}{4k-3}$$

$$= \frac{5(4k-3) - 2(4k+3)}{(4k+3)(4k-3)}$$

$$= \frac{20k - 15 - 8k - 6}{16k^2 - 9}$$

$$= \frac{12k - 21}{16k^2 - 9}$$

4. A

$$(3a + 2b)(4a - 5b) - a(6a + 4b)$$

$$= (3a + 2b)(4a - 5b) - 2a(3a + 2b)$$

$$= (3a + 2b)(4a - 5b - 2a)$$

$$= (3a + 2b)(2a - 5b)$$

5. B

$$f(1 + \beta) - f(1 - \beta)$$

$$= 3(1 + \beta)^2 - (1 + \beta) - 2 - [3(1 - \beta)^2 - (1 - \beta) - 2]$$

$$= 3(1 + 2\beta + \beta^2) - 1 - \beta - 2 - [3(1 - 2\beta + \beta^2) - 1 + \beta - 2]$$

$$= 3 + 6\beta + 3\beta^2 - 3 - \beta - 3 + 6\beta - 3\beta^2 + 3 - \beta$$

$$= 10\beta$$

6. D

By Factor theorem, $g(-2) = 0$.

i.e. $a(-2)^3 + 4a(-2)^2 - 24 = 0$

$$-8a + 16a - 24 = 0$$

$$8a - 24 = 0$$

$$a = 3$$

$$\therefore g(x) = 3x^3 + 12x^2 - 24$$

$$g(2) = 3(2)^3 + 12(2)^2 - 24$$

$$= 48$$

7. C

Substitute $x = -6$ into the identity,

$$(-6 + h)(-6 + 6) = (-6 + 4)^2 + k$$

$$k + 4 = 0$$

$$k = -4$$

Alternatively

L.H.S. = $x^2 + (h + 6)x + 6h$

R.H.S. = $x^2 + 8x + 16 + k$

By comparing the coefficients of x , $h + 6 = 8 \rightarrow h = 2$

By comparing the constant terms,

$$16 + k = 6h = 6(2) = 12$$

$$\rightarrow k = -4$$

8. A

Rewrite L_1 as $y = -\frac{1}{a}x - \frac{b}{a}$ and L_2 as $y = -bx - c$.From the figure, the y-intercept of $L_2 = -c > 0 \rightarrow c < 0$ \therefore I is true.From the figure, the y-intercept of $L_1 = -\frac{b}{a} > 0 \rightarrow -ab > 0$ i.e. $ab < 0 < 1$ \therefore II is true.From the figure, the slope of $L_1 = -\frac{1}{a} > 0 \rightarrow a < 0$ Also, from the figure, the y-intercept of $L_2 >$ the y-intercept of L_1

i.e. $-c > -\frac{b}{a}$

$$\rightarrow c < \frac{b}{a}$$

$$\rightarrow ac > b \quad [\because a < 0]$$

 \therefore III is NOT true.

9. A

Let C and S be the cost and the selling price of the toy respectively. Then,

$$C = (1 - x\%)S \dots (1)$$

$$S = (1 + 25\%)C \quad \text{i.e. } S = 1.25C \dots (2)$$

Substitute (2) into (1),

$$C = (1 - x\%)(1.25C)$$

$$1.25(1 - x\%) = 1$$

$$x = 20$$

10. B

$$\text{Note that } 1 \text{ km}^2 = 1 \times 10^6 \text{ m}^2 = 1 \times 10^{10} \text{ cm}^2$$

$$\text{Then, } 0.75 \text{ km}^2 = 0.75 \times 10^{10} \text{ cm}^2 = 7.5 \times 10^9 \text{ cm}^2$$

Let the scale of the map be $1 : n$. Note that the area of the golf course on the map and the actual area of the golf course are similar figures.

$$\left(\frac{1}{n}\right)^2 = \frac{300}{7.5 \times 10^9}$$

$$n = 5000$$

11. A

$$w = ku^3\sqrt{v} \quad \text{where } k \text{ is a constant.}$$

$$w = k(4)^3\sqrt{9} \dots (1)$$

$$8 = k(2)^3\sqrt{4} \dots (2)$$

$$(1) \div (2),$$

$$\frac{w}{8} = \frac{k(4)^3\sqrt{9}}{k(2)^3\sqrt{4}}$$

$$w = 96$$

12. D

$$T(1) = 3$$

$$T(2) = 3 + [2(1) + 1] = 6$$

$$T(3) = 6 + [2(2) + 1] = 11$$

$$T(4) = 11 + [2(3) + 1] = 18$$

$$T(5) = 18 + [2(4) + 1] = 27$$

$$T(6) = 27 + [2(5) + 1] = 38$$

$$T(7) = 38 + [2(6) + 1] = 51$$

13. D

$$5 - 4x < 9 \text{ and } \frac{2x-3}{7} > 1$$

$$4x > 5 - 9 \text{ and } 2x - 3 > 7$$

$$4x > -4 \text{ and } 2x > 10$$

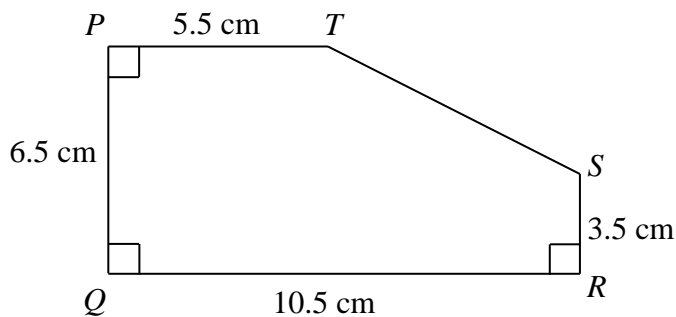
$$x > -1 \text{ and } x > 5$$

$$\therefore x > 5$$

14. B

Absolute error of the measurement = 0.5 cm

The largest possible measurements :

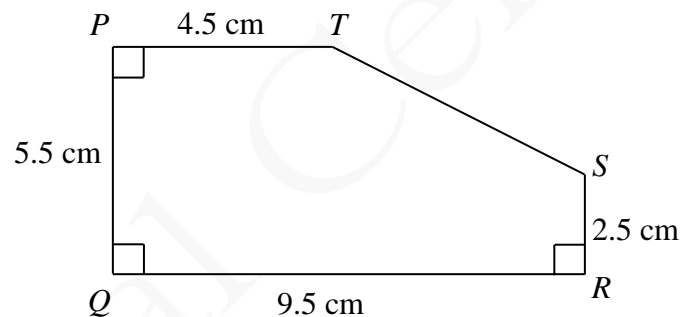


The largest possible value of A

$$= 6.5 \times 5.5 + \frac{(6.5+3.5) \times (10.5-5.5)}{2}$$

$$= 60.75$$

The smallest possible measurements :



The smallest possible value of A

$$= 5.5 \times 4.5 + \frac{(5.5+2.5) \times (9.5-4.5)}{2}$$

$$= 44.75$$

15. D

Let r and θ be the original radius and angle of the sector respectively.

$$2\pi r \times \frac{\theta}{360^\circ} = 2\pi r(1 - 60\%) \times \frac{\theta(1+k\%)}{360^\circ}$$

$$0.4(1 + k\%) = 1$$

$$k = 150$$

16. B

$$\pi(5a)^2(7b) = 525 \quad \text{i.e.} \quad \pi a^2 b = 3 \dots (1)$$

The volume of the cone

$$= \frac{1}{3}\pi(7a)^2(5b)$$

$$= \frac{245}{3}\pi a^2 b$$

$$= \frac{245}{3}(3) \quad [\text{From (1)}]$$

$$= 245 \text{ cm}^3$$

17. C

Note that $\triangle OPU \sim \triangle OQT \sim \triangle ORS$.

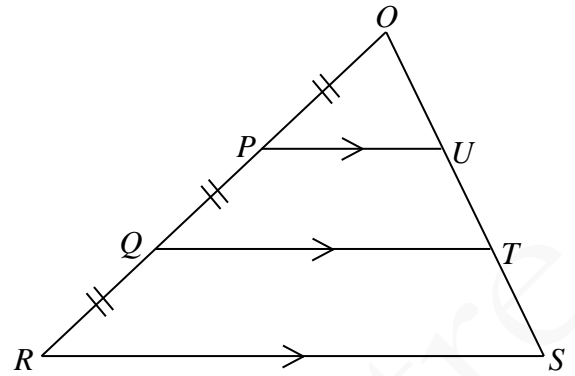
Let the area of $\triangle OPU$ be x . Then,

$$\frac{\text{Area of } \triangle OPU}{\text{Area of } \triangle OQT} = \left(\frac{OP}{OQ}\right)^2 \quad \text{and} \quad \frac{\text{Area of } \triangle OPU}{\text{Area of } \triangle ORS} = \left(\frac{OP}{OR}\right)^2$$

$$\frac{x}{\text{Area of } \triangle OQT} = \left(\frac{1}{2}\right)^2 \quad \text{and} \quad \frac{x}{\text{Area of } \triangle ORS} = \left(\frac{1}{3}\right)^2$$

\therefore Area of $\triangle OQT = 4x$ and area of $\triangle ORS = 9x$

$$\begin{aligned} \text{Area of trapezium } PQTU : \text{area of trapezium } QRST \\ &= (\text{Area of } \triangle OQT - \text{area of } \triangle OPU) : (\text{area of } \triangle ORS - \text{area of } \triangle OQT) \\ &= (4x - x) : (9x - 4x) \\ &= 3 : 5 \end{aligned}$$



18. B

Note that $EA : BC = 2 : 7$.

Note that $\triangle AEG \sim \triangle CBD$.

$$\therefore \frac{\text{Area of } \triangle AEG}{\text{Area of } \triangle CBD} = \left(\frac{EA}{BC}\right)^2$$

$$\text{i.e. } \frac{48}{\text{Area of } \triangle CBD} = \left(\frac{2}{7}\right)^2 \rightarrow \text{Area of } \triangle CBD = 588 \text{ cm}^2$$

Note that $\triangle AEG \sim \triangle BFG$ with $AG : BG = AE : BF = 2 : 5$.

Then, $BG : DC = 5 : 7$.

Also note that $\triangle BGH \sim \triangle DCH$ with $BH : DH = BG : DC = 5 : 7$.

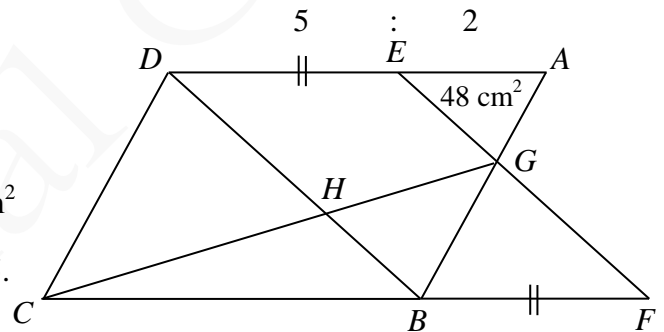
Area of $\triangle CBH : \text{area of } \triangle CDH = BH : DH = 5 : 7$ ($\because \triangle CBH$ and $\triangle CDH$ have the same height.)

Let area of $\triangle CBH = 5k$ and area of $\triangle CDH = 7k$ where k is a constant.

Then, area of $\triangle CBD = \text{area of } \triangle CBH + \text{area of } \triangle CDH$

$$\text{i.e. } 588 = 5k + 7k \rightarrow k = 49$$

$$\begin{aligned} \therefore \text{Area of } \triangle CDH &= 7k \\ &= 7(49) \\ &= 343 \text{ cm}^2 \end{aligned}$$



19. B

Draw a straight line parallel to the parallel lines as shown.

$$x = u \text{ (alt. } \angle\text{s, // lines)}$$

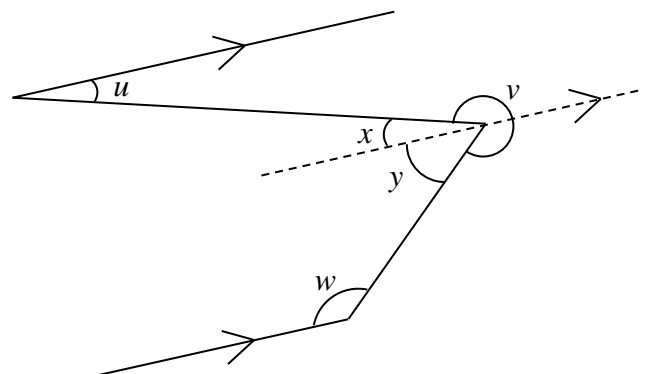
$$y + w = 180^\circ \text{ (int. } \angle\text{s, // lines)}$$

$$y = 180^\circ - w$$

$$x + y + v = 360^\circ \text{ (} \angle\text{s at a pt.)}$$

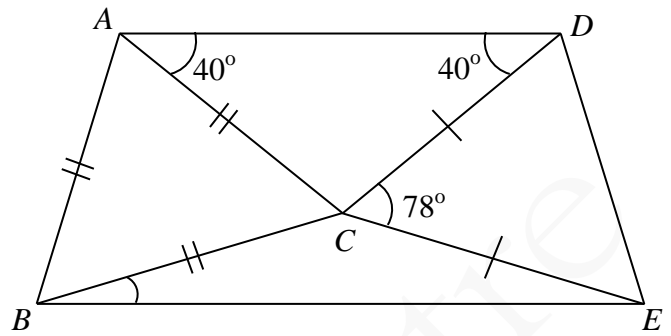
$$u + (180^\circ - w) + v = 360^\circ$$

$$\rightarrow u + v - w = 180^\circ$$



20. D

$\angle ACB = 60^\circ$ (prop. of equilateral \triangle)
 $\angle ACD + \angle CAD + \angle CDA = 180^\circ$ (\angle sum of \triangle)
 $\angle ACD + 40^\circ + 40^\circ = 180^\circ$
 $\angle ACD = 100^\circ$
 $\angle BCE + \angle ACB + \angle ACD + \angle DCE = 360^\circ$ (\angle s at a pt.)
 $\angle BCE + 60^\circ + 100^\circ + 78^\circ = 360^\circ$
 $\angle BCE = 122^\circ$
 $CA = CD$ (sides opp. equal \angle s)
 $\therefore BC = CA = CD = CE$
 $\angle CBE = \angle CEB$ (base \angle s, isos. \triangle)
 $\angle CBE + \angle CEB + \angle BCE = 180^\circ$ (\angle sum of \triangle)
 $2\angle CBE + 122^\circ = 180^\circ$
 $\angle CBE = 29^\circ$

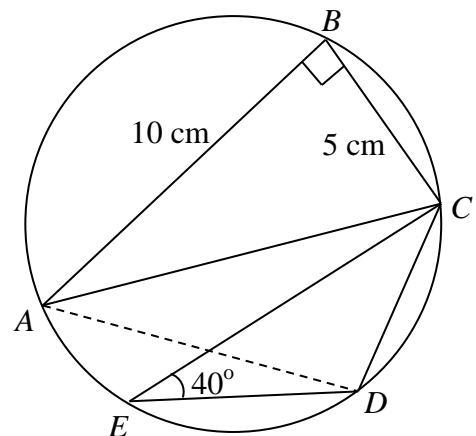


21. C

$BE^2 + CE^2 = 8^2 + 15^2 = 17^2 = BC^2$
 $\therefore \triangle BEC$ is a right-angled \triangle with $\angle BEC = 90^\circ$ (converse of Pythagoras' Theorem)
 Then, area of $\triangle BEC$
 $= \frac{8 \times 15}{2}$
 $= 60 \text{ cm}^2$
 The area of rectangle $ABCD = 2 \times \text{area of } \triangle BEC$
 $= 2 \times 60$
 $= 120 \text{ cm}^2$

22. C

$\therefore \angle ABC = 90^\circ$
 $\therefore AC$ is a diameter. (Converse of \angle in semi-circle)
 By Pythagoras' Theorem,
 $AC^2 = AB^2 + BC^2$
 $= 10^2 + 5^2$
 $AC = \sqrt{125} \text{ cm}$
 Join AD .
 $\angle ADC = 90^\circ$ (\angle in semi-circle)
 $\angle CAD = \angle CED$
 $= 40^\circ$ (\angle s in the same segment)
 $\therefore \frac{CD}{AC} = \sin 40^\circ$
 $CD = \sqrt{125} \sin 40^\circ$
 $= 7 \text{ cm}$ (correct to the nearest cm)

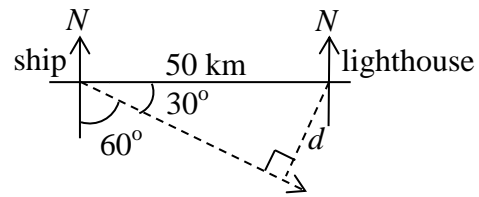


23. B

As shown, the shortest distance between the ship and the lighthouse is d . Then,

$$\frac{d}{50} = \sin 30^\circ$$

$$d = 50 \sin 30^\circ = 25 \text{ km}$$



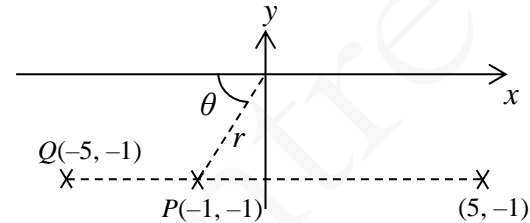
24. D

$$r = \sqrt{(-1)^2 + (-1)^2} = \sqrt{2}$$

$$\tan \theta = 1$$

$$\theta = 45^\circ$$

\therefore The polar coordinates of P are $(\sqrt{2}, 180^\circ + 45^\circ)$. i.e. $(\sqrt{2}, 225^\circ)$



25. A

The locus of a moving point at a constant distance from a fixed point is a circle.

26. D

Slope of L is $-\frac{k}{4}$ and slope of the straight line $6x - 9y + 4 = 0$ is $\frac{2}{3}$.

$$-\frac{k}{4} \times \frac{2}{3} = -1 \quad [\because \text{The two straight lines are perpendicular to each other.}]$$

$$\rightarrow k = 6$$

Then, the equation of L is $6x + 4y - 12 = 0$. i.e. $3x + 2y - 6 = 0$

Substituting $x = 0$ into $3x + 2y - 6 = 0$, we get the y -intercept of L is 3.

27. C

Rewrite the equation of the circle C_1 as $x^2 + y^2 + 2x + 4y - \frac{149}{2} = 0$.

Centre of $C_1 = (-\frac{2}{2}, -\frac{4}{2})$ i.e. $(-1, -2)$

Centre of $C_2 = (-\frac{-8}{2}, -\frac{-20}{2})$ i.e. $(4, 10)$

Substitute $(-1, -2)$ into the equation of C_2 , $(-1)^2 + (-2)^2 - 8(-1) - 20(-2) - 53 = 0$.

\therefore I is true.

The radius of C_1 , $r_1 = \sqrt{(-1)^2 + (-2)^2 - (-\frac{149}{2})} = \sqrt{\frac{159}{2}}$

The radius of C_2 , $r_2 = \sqrt{4^2 + 10^2 - (-53)} = 13 \neq r_1$

\therefore II is NOT true.

Note that the centre of C_1 lies on C_2 and $r_1 < r_2$.

\therefore C_1 and C_2 must intersect at two distinct points.

\therefore III is true.

28. B

There are 6 possible outcomes (3, 5), (3, 7), (3, 9), (5, 7), (5, 9) and (7, 9).

Favourable outcomes are (5, 9) and (7, 9).

$$\begin{aligned} \text{The required probability} &= \frac{2}{6} \\ &= \frac{1}{3} \end{aligned}$$

29. A

The 1st quartile, $Q_1 = 5$ and the 3rd quartile, $Q_3 = 6$

$$\begin{aligned} \therefore \text{The inter-quartile range} &= Q_3 - Q_1 \\ &= 6 - 5 \\ &= 1 \end{aligned}$$

30. A

Without loss of generality, let $m \leq n$.

If $3 \leq m \leq n \leq 8$, $x = 8$ and $z = 3$ (for $m = n = 3$) or 8. The mean is not fixed.

If $3 \leq m \leq 8 \leq n \leq 12$, $x = 8$ and $z = 3$ (for $m = 3$) or 8. The mean is not fixed.

If $8 \leq m \leq n \leq 12$, $x = 8$ and $z = 8$, 10 ($m = n = 10$) or 12 ($m = n = 12$). The mean is not fixed.

In all cases, $x = 8$ must be true.

31. B

$$\begin{aligned} &B0000000000000030_{16} \\ &= B \times 16^{15} + 3 \times 16^1 \\ &= 11 \times (2^4)^{15} + 48 \\ &= 11 \times 2^{60} + 48 \end{aligned}$$

32. B

$$(\log_{\pi} x)^2 - 10\log_{\pi} x + 24 = \log_{\pi} x$$

$$(\log_{\pi} x)^2 - 11\log_{\pi} x + 24 = 0$$

$$(\log_{\pi} x - 3)(\log_{\pi} x - 8) = 0$$

$$\log_{\pi} x = 3 \text{ or } 8$$

$$x = \pi^3 \text{ or } \pi^8$$

$$\alpha\beta = \pi^3 \times \pi^8 = \pi^{11}$$

Alternatively

$$(\log_{\pi} x)^2 - 11\log_{\pi} x + 24 = 0$$

$$\log_{\pi} \alpha + \log_{\pi} \beta = 11 \quad [\because \text{sum of roots} = -\frac{b}{a}]$$

$$\log_{\pi}(\alpha\beta) = 11$$

$$\alpha\beta = \pi^{11}$$

33. D

As y decreases with x , $0 < a < 1$.

As y increases with x , $b > 1$.

As the graph of $y = a^x$ is the reflection image of the graph of $y = b^x$, $a = \frac{1}{b}$. i.e. $ab = 1$

34. C

Slope of the straight line = $\frac{1-0}{0-(-4)} = \frac{1}{4}$. Then, the equation of the straight line is

$$\sqrt{y} = \frac{1}{4}x^3 + 1$$

When $x = 2$,

$$\sqrt{y} = \frac{1}{4}(2)^3 + 1$$

$$\sqrt{y} = 3$$

$$y = 9$$

35. D

$$\log a - \log a^{-3} = \log a - (-3)\log a = 4\log a$$

$$\log a^5 - \log a = 5\log a - \log a = 4\log a = \log a - \log a^{-3}$$

\therefore I is an arithmetic sequence.

$$(9 - 5a) - (8 - 4a) = 9 - 5a - 8 + 4a = 1 - a$$

$$(10 - 6a) - (9 - 5a) = 10 - 6a - 9 + 5a = 1 - a = (9 - 5a) - (8 - 4a)$$

\therefore II is an arithmetic sequence.

$$\cos 90^\circ - \cos(90 - a)^\circ = -\cos(90 - a)^\circ = -\sin a^\circ$$

$$\cos(90 + a)^\circ - \cos 90^\circ = \cos(90 + a)^\circ = -\sin a^\circ = \cos 90^\circ - \cos(90 - a)^\circ$$

\therefore III is an arithmetic sequence.

36. C

Draw the straight lines of $x = 2$, $2x + y + 3 = 0$ and $x + y + 1 = 0$ respectively.

Shade the region D .

The points of intersections are $(0, -1)$, $(0, -3)$, $(2, -3)$, $(2, -7)$.

Let $P = 4x + 3y + k$.

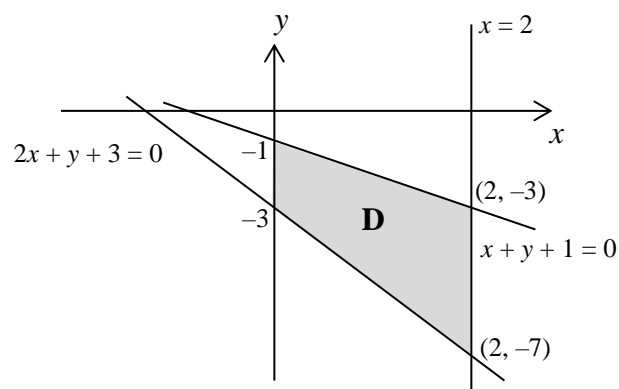
$$P(0, -1) = 4(0) + 3(-1) + k = -3 + k$$

$$P(0, -3) = 4(0) + 3(-3) + k = -9 + k$$

$$P(2, -3) = 4(2) + 3(-3) + k = -1 + k$$

$$P(2, -7) = 4(2) + 3(-7) + k = -13 + k$$

\therefore The lease value = $-13 + k = 24 \rightarrow k = 37$



37. C

$$z_1 = \frac{2+ki}{1+i} \times \frac{1-i}{1-i}$$

$$= \frac{2+ki-2i-ki^2}{1^2-i^2}$$

$$= \frac{k+2}{2} + \frac{k-2}{2}i$$

$$z_2 = \frac{k+5i}{2-i} \times \frac{2+i}{2+i}$$

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

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

$$\therefore \frac{k-2}{2} = \frac{k+10}{5}$$

$$k = 10$$

$$z_1 - z_2 = \frac{10+2}{2} + \frac{10-2}{2}i - \left(\frac{2(10)-5}{5} + \frac{10+10}{5}i \right)$$

$$= 3$$

38. A

Note that $ED = AC = 12$ cm.

By Pythagoras' Theorem,

$$PD^2 = EP^2 + ED^2 \\ = 5^2 + 12^2$$

$$PD = 13 \text{ cm}$$

By Pythagoras' Theorem,

$$PB^2 = AP^2 + AB^2 \\ = 9^2 + 12^2$$

$$PB = 15 \text{ cm}$$

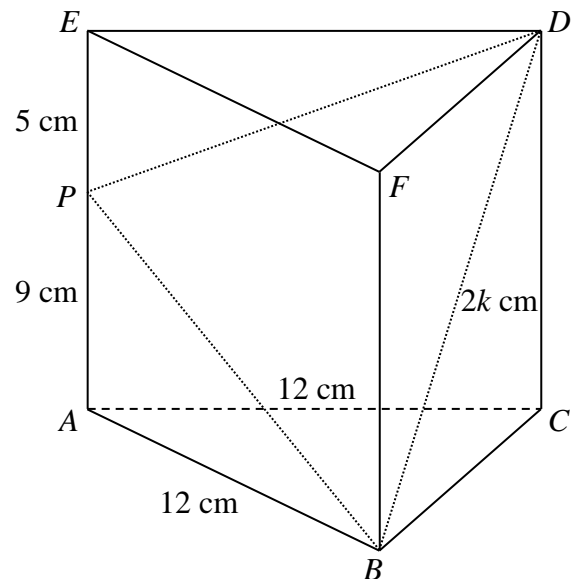
$$s = \frac{PB+PD+BD}{2}$$

$$= \frac{13+15+2k}{2}$$

$$= 14 + k$$

By Heron's formula,

$$\begin{aligned} \text{the area of } \triangle BDP &= \sqrt{(14+k)(14+k-2k)(14+k-13)(14+k-15)} \\ &= \sqrt{(14+k)(14-k)(k+1)(k-1)} \\ &= \sqrt{(k^2-1)(196-k^2)} \end{aligned}$$



39. A

Let O be the centre of circle CDE .

Then, $\angle OEB = \angle OCQ = 90^\circ$ (tangent \perp radius)

$$\begin{aligned} \angle OCB &= \angle OCQ - \angle BCQ \\ &= 90^\circ - 35^\circ \\ &= 55^\circ \end{aligned}$$

$\angle EDC + \angle ADE = 180^\circ$ (adj. \angle s on st. line)

$$\angle EDC + 100^\circ = 180^\circ$$

$$\angle EDC = 80^\circ$$

$$\begin{aligned} \angle EOC &= 2\angle EDC \text{ (}\angle \text{ at centre twice } \angle \text{ at } \odot^{\text{cc}}\text{)} \\ &= 2(80^\circ) \\ &= 160^\circ \end{aligned}$$

$\angle ABC + \angle OEB + \angle OCB + \angle EOC = 360^\circ$ (\angle sum of polygon)

$$\angle ABC + 90^\circ + 55^\circ + 160^\circ = 360^\circ$$

$$\angle ABC = 55^\circ$$

Alternatively

Let F be the point of intersection of BC and circle CDE .

Join DF and EF .

$\angle BAC = \angle BCQ = 35^\circ$ (\angle in alt. segment)

$\angle DEA + \angle DAE + \angle ADE = 180^\circ$ (\angle sum of Δ)

$$\angle DEA + 35^\circ + 100^\circ = 180^\circ$$

$$\angle DEA = 45^\circ$$

$\angle EFD = \angle DEA = 45^\circ$ (\angle in alt. segment)

$\angle CDF = \angle BCQ = 35^\circ$ (\angle in alt. segment)

$\angle EDF + \angle CDF + \angle ADE = 180^\circ$ (adj. \angle s on st. line)

$$\angle EDF + 35^\circ + 100^\circ = 180^\circ$$

$$\angle EDF = 45^\circ$$

$\angle DEF + \angle EFD + \angle EDF = 180^\circ$ (\angle sum of Δ)

$$\angle DEF + 45^\circ + 45^\circ = 180^\circ$$

$$\angle DEF = 90^\circ$$

$\angle ACB + \angle DEF = 180^\circ$ (opp. \angle s, cyclic quad.)

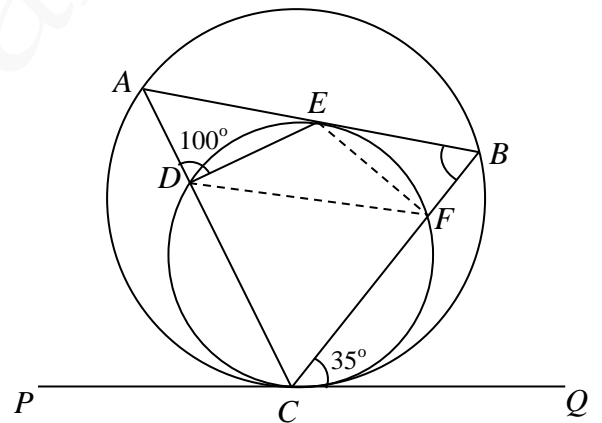
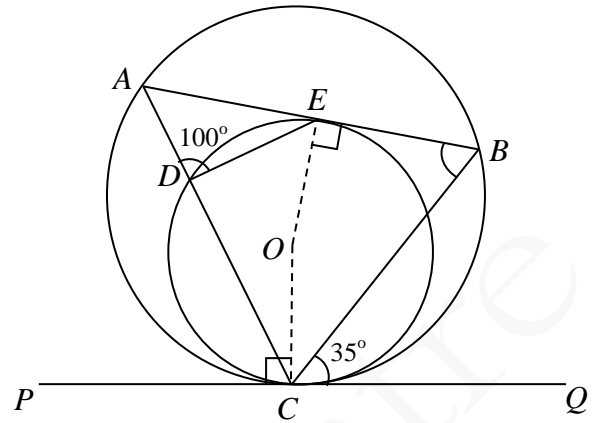
$$\angle ACB + 90^\circ = 180^\circ$$

$$\angle ACB = 90^\circ$$

$\angle ABC + \angle BAC + \angle ACB = 180^\circ$ (\angle sum of Δ)

$$\angle ABC + 35^\circ + 90^\circ = 180^\circ$$

$$\angle ABC = 55^\circ$$



40. D

As shown in the figure, the radius of the inscribed circle = $a - 31$.

The coordinates of the centre of the inscribed circle are $(31, 0)$.

By Pythagoras' Theorem,

$$\begin{aligned} AB^2 &= OA^2 + OB^2 \\ &= 8^2 + 6^2 \end{aligned}$$

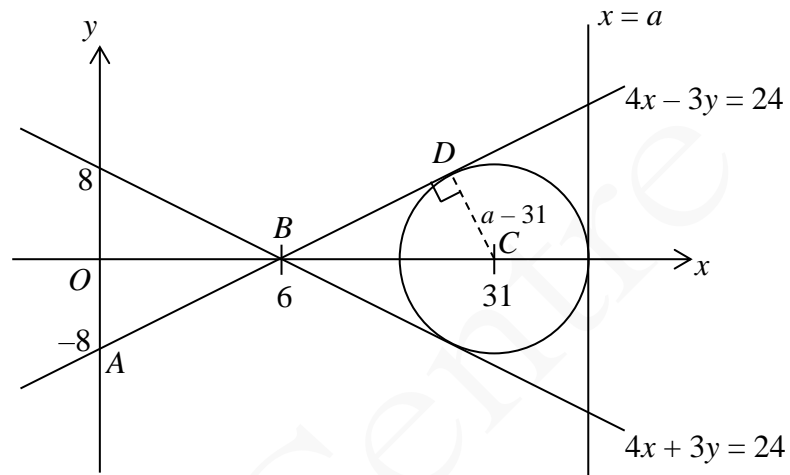
$$AB = 10$$

Note that $\triangle AOB \sim \triangle CDB$. Then,

$$\frac{CD}{AO} = \frac{CB}{AB}$$

$$\frac{a-31}{8} = \frac{31-6}{10}$$

$$a = 51$$



41. D

$$\begin{cases} x - y + 9 = 0 & \text{i.e. } x = y - 9 \dots (1) \\ x^2 + y^2 - 6x + cy - 7 = 0 \dots (2) \end{cases}$$

Substitute (1) into (2),

$$\begin{aligned} (y - 9)^2 + y^2 - 6(y - 9) + cy - 7 &= 0 \\ y^2 - 18y + 81 + y^2 - 6y + 54 + cy - 7 &= 0 \\ 2y^2 + (c - 24)y + 128 &= 0 \end{aligned}$$

For the circle and the straight line intersect, $\Delta \geq 0$.

$$\begin{aligned} \text{i.e. } (c - 24)^2 - 4(2)(128) &\geq 0 \\ c^2 - 48c - 448 &\geq 0 \\ (c + 8)(c - 56) &\geq 0 \\ c &\leq -8 \text{ or } c \geq 56 \end{aligned}$$

42. A

The children must queue in this way:

B₁ G₁ B₂ G₂ B₃ G₃ B₄ G₄ B₅ G₅ B₆

$$\begin{aligned} \text{Number of queues} &= P_6^6 \times P_5^5 \\ &= 86\,400 \end{aligned}$$

43. B

The required probability

$$= 1 - P(\text{"4 Chinese books are chosen"}) - P(\text{"5 Chinese books are chosen"})$$

$$= 1 - \frac{C_4^8 C_1^7}{C_5^{15}} - \frac{C_5^8}{C_5^{15}}$$

$$= \frac{9}{11}$$

44. A

Let the test scores of the students be x_1 and x_2 (where $x_1 > x_2$) respectively. Let μ and σ be the mean and standard deviation of the test scores.

$$x_1 - x_2 = 30 \dots (1)$$

$$\frac{x_1 - \mu}{\sigma} - \frac{x_2 - \mu}{\sigma} = 6$$

$$\frac{x_1 - x_2}{\sigma} = 6 \dots (2)$$

Substitute (1) into (2),

$$\frac{30}{\sigma} = 6$$

$$\sigma = 5$$

45. C

The question is equivalent to finding the variance of 3, 5, 9, 11, 15 and 17 as the common term $20a$ has no effect on the variance.

$$\text{Mean of 3, 5, 9, 11, 15 and 17} = \frac{3+5+9+11+15+17}{6} = 10$$

$$\begin{aligned} \text{Variance} &= \frac{(3-10)^2 + (5-10)^2 + (9-10)^2 + (11-10)^2 + (15-10)^2 + (17-10)^2}{6} \\ &= 25 \end{aligned}$$