Suggested Solution for 2021 HKDSE Mathematics(core) Multiple Choice Questions

1. B

$\frac{(2^n)(8^{3n})}{64^n}$

$=\frac{(2^n)(2^3)^{3n}}{(2^6)^n}$

$=\frac{(2^n)(2^{9n})}{2^{6n}}$

$= 2^{n+9n-6n}$

$= 2^{4n}$

$= (2^2)^{2n}$

$= 4^{2n}$

2. C

$m(m-a) = a(1-m)$

$m^2 - am = a - am$

$a = m^2$

3. D

$(u + v)(u - v)(u - 1)$

$=(u^2 - v^2)(u - 1)$

$= u^2(u - 1) - v^2(u - 1)$

$=u^3 - u^2 - uv^2 + v^2$

4. B

$\frac{6}{n-6} - \frac{7}{n-7}$

$= \frac{6(n-7)-7(n-6)}{(n-6)(n-7)}$

$= \frac{6n-42-7n+42}{(n-6)(n-7)}$

$= \frac{-n}{(n-6)(n-7)}$

$= \frac{n}{(n-6)(7-n)}$

5. D

Maximum absolute error = 0.01 ÷ 2 = 0.005

Lower limit of x = 6.24 – 0.005 = 6.235

Upper limit of x = 6.24 + 0.005 = 6.245

$\therefore \quad 6.235 \leq x < 6.245$

6. D

$a(x + 3) + b(3x + 1) \equiv c(x + 2)$

$(a + 3b)x + 3a + b \equiv cx + 2c$

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

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

$a = 5b$

$\frac{a}{b} = 5$ i.e. $a : b = 5 : 1$

7. A

$f(0) = 1 \Rightarrow (0 + h)(0 - 3) + k = 1$

$-3h + k = 1 \ldots (1)$

$f(8) = 1 \Rightarrow (8 + h)(8 - 3) + k = 1$

$5h + k = -39 \ldots (2)$

(2) – (1),

$8h = -40$

$h = -5 \ldots (3)$

Substitute (3) into (1),

$-3(-5) + k = 1$

$k = -14$

8. B

Let $p(x) = (x^2 - 1)Q(x) + ax + b$ where a and b are constants. Note that $ax + b$ is the remainder required.

By the Remainder theorem,

$p(-1) = -a + b = -2 \ldots (1)$

$p(1) = a + b = 0 \ldots (2)$

(1) + (2),

$2b = -2$

$b = -1 \ldots (3)$

Substitute (3) into (2),

$a + (-1) = 0$

$a = 1$

$\therefore$ The required remainder is $x - 1$.

9. A

Let the number of students in the school be n. Then,

$n \times 33\% = n \times 60\% \times 45\% + n \times (1 - 60\%) \times x\%$

$x = 15$

10. C

$9x + 8 \leq 4(x - 3)$ or $6 - 7x > 20$

$9x + 8 \leq 4x - 12$ or $-7x > 20 - 6$

$5x \leq -20$ or $7x < -14$

$x \leq -4$ or $x < -2$

i.e. $x < -2$

11. C

$\frac{2\alpha+3\beta}{3\alpha+2\beta} = \frac{7}{10}$

$10(2\alpha + 3\beta) = 7(3\alpha + 2\beta)$

$20\alpha + 30\beta = 21\alpha + 14\beta$

$\alpha = 16\beta$

$\therefore \frac{2\alpha+\beta}{\alpha+2\beta} = \frac{2(16\beta)+\beta}{16\beta+2\beta}$

$= \frac{11}{6}$

12. B

Let $w = \frac{kx^2}{y^3}$ where k is a constant. Then,

$k = \frac{wy^3}{x^2}$

$\therefore \frac{x^2}{wy^3} = \frac{1}{k}$ is also a constant.

13. C

$T_1 = 3$

$T_2 = 3 + 2(1) + 3 = 8$

$T_3 = 8 + 2(2) + 3 = 15$

$T_4 = 15 + 2(3) + 3 = 24$

$T_5 = 24 + 2(4) + 3 = 35$

$T_6 = 35 + 2(5) + 3 = 48$

$T_7 = 48 + 2(6) + 3 = 53$

$T_8 = 53 + 2(7) + 3 = 80$

14. A

$y = (m - x)^2 + n$

$= x^2 - 2mx + m^2 + n$

$\because$ $a = 1 > 0$

$\therefore$ The graph opens upwards. i.e. I is true.

y-intercept $= m^2 + n$ is negative if $n < -m^2$

$\therefore$ II may not be true.

Substitute $x = n$ into the function,

$y = n^2 - 2mn + m^2 + n \neq m$

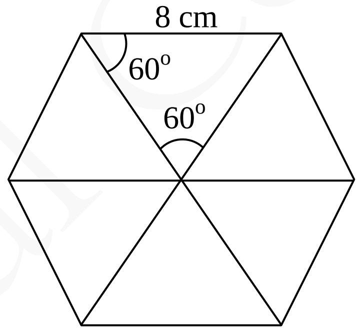
$\therefore$ III may not be true.

15. C

As shown on the right, a regular 6-sided polygon is consisted of 6 equilateral triangles.

Area of the regular 6-sided polygon

$= \frac{1}{2} \times 8 \times 8 \times \sin 60^\circ \times 6$



$= 96\sqrt{3}$ cm^2

Let h cm be the height of the prism.

$96\sqrt{3} \times h = 288$

$h = \sqrt{3}$

Total surface area

$= 8 \times 6 \times \sqrt{3} + 96\sqrt{3} \times 2$

$= 240\sqrt{3}$

$\approx$ 416 (correct to the nearest cm^2)

16. A

Let $2r$ cm and $3r$ cm be the radii of the smaller hemisphere and the larger hemisphere respectively. Then,

$3\pi(2r)^2 + 3\pi(3r)^2 = 351\pi$

$r = 3$

$\therefore$ The radii of the two hemispheres are 6 cm and 9 cm respectively.

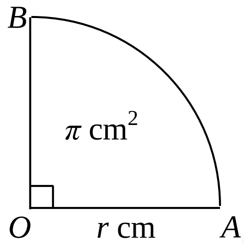
The difference of the volumes of the two hemispheres

$= \frac{1}{2} \times \frac{4}{3} \times \pi(9)^3 - \frac{1}{2} \times \frac{4}{3} \times \pi(6)^3$

$= 342\pi$ cm^3

17. B

Let r cm be the radius of the sector.



$\frac{1}{4}\pi r^2 = \pi$

$r = 2$

$\therefore$ I is true.

The perimeter of the sector

$= 2r + \frac{1}{4} \times 2\pi r$

$= 2(2) + \frac{1}{4} \times 2\pi(2)$

$= 4 + \pi$ cm

$\therefore$ II is not true.

$\because$ $\angle AOB = 90^o$

$\therefore$ For the circle passing through O, A and B, AB is a diameter. (Converse of $\angle$ in semi-circle)

By Pythagoras' theorem,

$AB^2 = OA^2 + OB^2$

$= 2^2 + 2^2$

$AB = 2\sqrt{2}$

Radius of the circle passing through O, A and B = $AB \div 2 = \sqrt{2}$ cm

Area of the circle $= \pi(\sqrt{2})^2 = 2\pi$ cm^2

$\therefore$ III is true.

18. B

$\angle BAE = \angle ADC = 28^o$ (alt. $\angle$s, $AB//CD$)

$\angle ABE + \angle BAE + \angle AEB = 180^o$ ($\angle$ sum of $\triangle$)

$\angle ABE + 28^o + 94^o = 180^o$

$\angle ABE = 58^o$

$\angle BAC = \angle BCA$ (base $\angle$s, isos. $\triangle$)

$\angle ABC + \angle BCA + \angle BAC = 180^o$ ($\angle$ sum of $\triangle$)

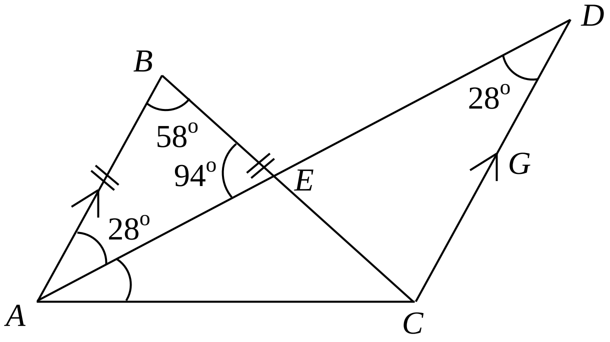
$58^o + 2\angle BAC = 180^o$

$\angle BAC = 61^o$

$\angle CAD = \angle BAC - \angle BAE$

$= 61^o - 28^o$

$= 33^o$



19. D

Let $\angle DAE = x$. Then, $\angle ACB = \angle EGC = \angle ABE = x$.

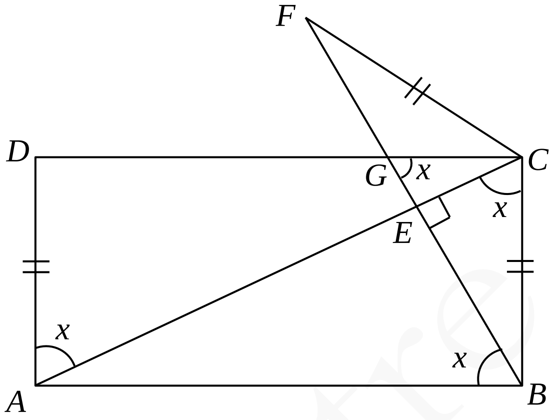
Also, $\angle CAB = \angle ECG = \angle CBE = 90^{\circ} - x$

$\angle CFE = \angle CBE = 90^{\circ} - x$ (base $\angle$s, isos. $\triangle$)

$\angle DGF = \angle EGC = x$ (vert. opp. $\angle$s)

i.e. $\angle DAE = \angle DGF$

$\therefore$ I is true.



In $\triangle BCE$ and $\triangle CGE$,

$\angle BCE = \angle CGE = x$

$\angle CBE = \angle GCE = 90^{\circ} - x$

$\angle CEB = \angle GEC = 90^{\circ}$

$\therefore$ $\triangle BCE \sim \triangle CGE$ (AAA)

$\therefore$ II is true.

In $\triangle BCE$ and $\triangle FCE$,

Note that $BC = AD$ (Properties of rectangle) and $CF = AD$ (Given)

$\therefore$ $BC = FC$

$CE = CE$ (common)

$\angle CEB = \angle CEF = 90^{\circ}$

$\therefore$ $\triangle BCE \cong \triangle FCE$ (RHS)

$\therefore$ III is true.

20. C

Let $BE = x$. Then, $AE = 3x$ and $AD = 4x$.

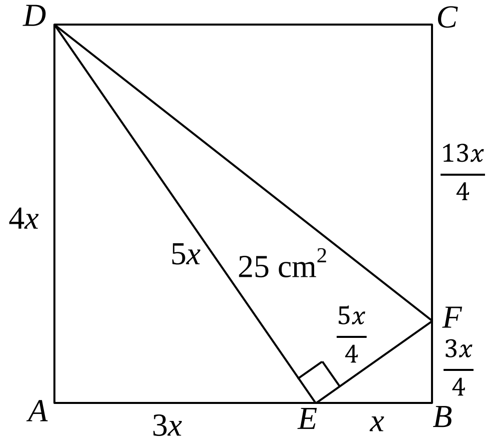
By Pythagoras' Theorem,

$DE^2 = AE^2 + AD^2$

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

$DE = 5x$

Note that $\triangle DAE \sim \triangle EBF$.



$\frac{EF}{DE} = \frac{EB}{DA}$ and $\frac{BF}{AE} = \frac{EB}{DA}$

$\frac{EF}{5x} = \frac{x}{4x}$ and $\frac{BF}{3x} = \frac{x}{4x}$

$EF = \frac{5x}{4}$ and $BF = \frac{3x}{4}$

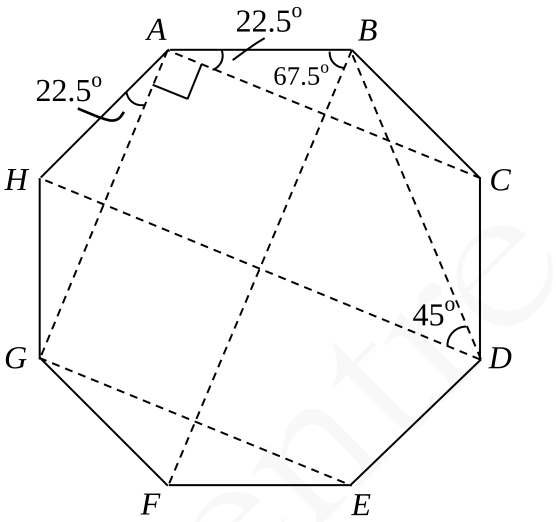
Also, $CF = BC - BF = 4x - \frac{3x}{4} = \frac{13x}{4}$

Area of $\triangle DEF = \frac{1}{2} \times 5x \times \frac{5x}{4} = 25$

➔ $x^2 = 8$

Area of $\triangle CDF = \frac{1}{2} \times 4x \times \frac{13x}{4} = \frac{13x^2}{2} = 52 \text{ cm}^2$

21. D



Each interior angle = $\frac{(8-2)\times 180^{\circ}}{8}$ = 135°

Note that $\triangle HAG$ is an isosceles $\triangle$.

$\angle HAG = \angle HGA$ (base $\angle$s, isos. $\triangle$)

$\angle AHG + \angle HAG + \angle HGA = 180^{\circ}$ ($\angle$ sum of $\triangle$)

$135^{\circ} + 2\angle HAG = 180^{\circ}$

$\angle HAG = 22.5^{\circ}$

$\angle BAG = \angle HAB - \angle HAG = 135^{\circ} - 22.5^{\circ} = 112.5^{\circ}$

By symmetry, $\angle ABF = \angle CBF = \frac{135^{\circ}}{2} = 67.5^{\circ}$

$\angle BAG + \angle ABF = 112.5^{\circ} + 67.5^{\circ} = 180^{\circ}$

$\therefore$ $AG \parallel BF$

$\therefore$ I is true.

It is not difficult to see that $\triangle BCD \cong \triangle EFG$.

$\therefore$ $BD = EG$ (corr. sides, $\cong\triangle$s)

$\therefore$ II is true.

By symmetry, $\angle BAC = \angle HAG = 22.5^{\circ}$.

$\angle CAG = \angle BAG - \angle BAC$

$= 112.5^{\circ} - 22.5^{\circ}$

$= 90^{\circ}$

$\angle CDH = \angle CDH \div 2 = 135^{\circ} \div 2 = 67.5^{\circ}$

Note that $\angle CDB = \angle HAG = 22.5^{\circ}$.

$\therefore$ $\angle BDH = \angle CDH - \angle CDB$

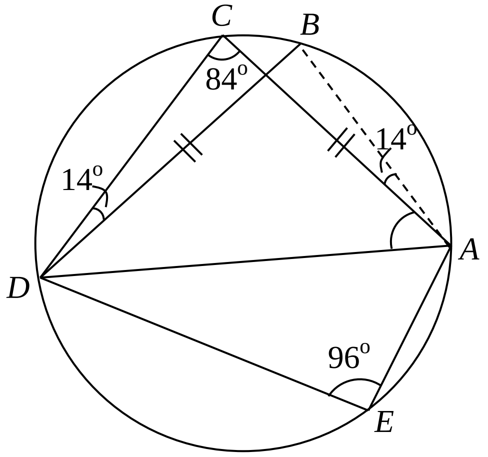
$= 67.5^{\circ} - 22.5^{\circ}$

$= 45^{\circ}$

i.e. $\angle CAG = 2\angle BDH$

$\therefore$ III is true.

22. A



$\angle BAC = \angle BDC = 14^{\circ}$ ($\angle$s in the same segment)

$\angle ACD + \angle AED = 180^{\circ}$ (opp. $\angle$s, cyclic quad.)

$\angle ACD + 96^{\circ} = 180^{\circ}$ ➔ $\angle ACD = 84^{\circ}$

$\because$ $AC = BD$

$\therefore$ $\angle ADC = \angle DAB$

i.e. $\angle ADB + 14^{\circ} = \angle CAD + 14^{\circ}$

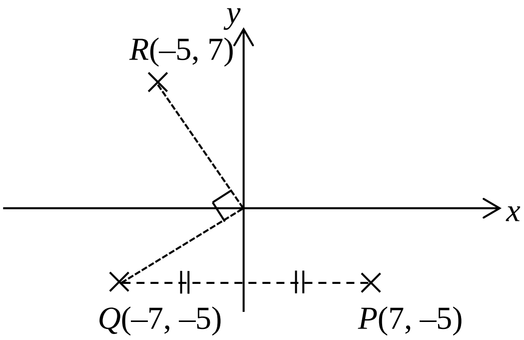
$\angle ADB = \angle CAD$

$\angle CAD + \angle ADB + \angle BDC + \angle ACD = 180^{\circ}$ ($\angle$ sum of $\triangle$)

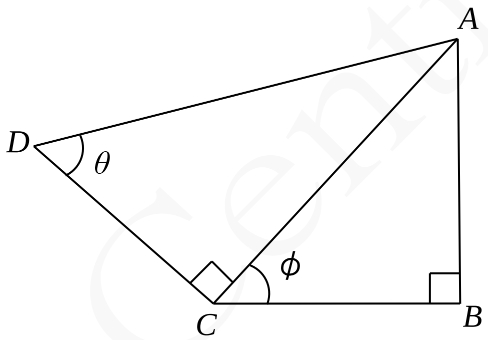
$2\angle CAD + 14^{\circ} + 84^{\circ} = 180^{\circ}$

$\angle CAD = 41^{\circ}$

23. B



24. D



$\sin \phi = \frac{AB}{AC}$ ➔ $AC = \frac{AB}{\sin \phi}$

$\tan \theta = \frac{AC}{CD}$ ➔ $AC = CD \tan \theta$

$\therefore \frac{AB}{\sin \phi} = CD \tan \theta$

i.e. $\frac{AB}{CD} = \tan \theta \sin \phi$

25. C

Let the coordinates of P be (x, y).

Then the equation of the locus of P is

$\sqrt{(x-5)^2 + (y-7)^2} = \sqrt{(6-5)^2 + (8-7)^2}$

$x^2 - 10x + 25 + y^2 - 14y + 49 = 2$

$x^2 + y^2 - 10x - 14y + 72 = 0$

26. A

Note that P is the mid-point of B and C.

$P = (\frac{5+9}{2}, \frac{8+2}{2}) = (7, 5)$

Slope of $AP = \frac{5-3}{7-3} = \frac{1}{2}$

Let the equation of AP be $y = \frac{1}{2}x + c$.

Substitute (3, 3) or (7, 5) into the equation,

$3 = \frac{1}{2}(3) + c$ or $5 = \frac{1}{2}(3) + c$

$c = \frac{3}{2}$

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

i.e. $x - 2y + 3 = 0$

Alternatively

The equation of AP is

$\frac{y-3}{x-3} = \frac{5-3}{7-3}$ / $\frac{y-5}{x-7} = \frac{5-3}{7-3}$

$2y - 6 = x - 3$ / $2y - 10 = x - 7$

i.e. $x - 2y + 3 = 0$

27. C

Centre of the circle, $O = (-\frac{-18}{2}, -\frac{-20}{2})$ i.e. (9, 10)

Let L_1 be the straight line joining O and (s, t).
Note that L_1 is perpendicular to L. (line from centre to mid-pt. of chord $\perp$ chord)

$\therefore$ Slope of L_1 × slope of $L = -1$

i.e. Slope of $L_1 \times 4 = -1$

Slope of $L_1 = -\frac{1}{4}$

$\therefore \frac{t-10}{s-9} = -\frac{1}{4}$

i.e. $s + 4t - 49 = 0$

28. D

Lower quartile = 62

The required probability $= \frac{20}{24}$

$= \frac{5}{6}$

29. B

The 1st quartile, $Q_1 = 26$ and the 3rd quartile, $Q_3 = 36$

$\therefore$ The inter-quartile range $= Q_3 - Q_1$

$= 36 - 26$

$= 10$

30. A

The mean of the remaining 40 integers $= \frac{70\times32-30\times24}{40}$

$= 38$

31. A

From the H.C.F. of the expressions, x^2 and z must come from the 3rd expression.
From the L.C.M. of the expression, y^4 must come from the 3rd expression.

$\therefore$ The 3rd expression is x^2y^4z.

32. D

$14 \times 16^{15} + 17 \times 16^{14} + 16^2 + 17$

$= 14 \times 16^{15} + (16 + 1) \times 16^{14} + 16^2 + 16 + 1$

$= 15 \times 16^{15} + 1 \times 16^{14} + 1 \times 16^2 + 1 \times 16 + 1 \times 16^0$

$= F100000000000111_{16}$

33. C

Substitute $y = 0$ into $y = a + \log_b x$,

$0 = a + \log_b x$

$x = b^{-a} = \frac{1}{b^a}$ i.e. $S = (\frac{1}{b^a}, 0)$

Substitute $y = 0$ into $y = \log_c x$,

$0 = \log_c x$

$x = 1$ i.e. $T = (1, 0)$

$\therefore$ $OT : OS = 1 : \frac{1}{b^a}$

$= b^a : 1$

34. C

Slope of the straight line = $\frac{2-0}{0-(-4)} = \frac{1}{2}$. Then, the equation of the straight line is

$\log_5 y = \frac{1}{2}\log_5 x + 2$

$= \log_5 x^{\frac{1}{2}} + \log_5 5^2$

$= \log_5 (25x^{\frac{1}{2}})$

$\therefore$ $y = 25x^{\frac{1}{2}}$

$y^2 = 625x$ i.e. $\frac{y^2}{x} = 625$

Alternatively

From the graph, we get

$\begin{cases} \log_5 x = 0 & \text{i.e. } x = 1 \\ \log_5 y = 2 & \text{i.e. } y = 5^2 = 25 \end{cases}$

Similarly,

$\begin{cases} \log_5 x = -4 & \text{i.e. } x = 5^{-4} \\ \log_5 y = 0 & \text{i.e. } y = 1 \end{cases}$

From the choices of the answer, we see that $x^m y^n = 625$ where m and n are constants.

Substitute (1, 25) into $x^m y^n = 625$,

$(1)^m(25)^n = 625$

➔ $n = 2$

Substitute $(5^{-4}, 1)$ into $x^m y^n = 625$,

$(5^{-4})^m(1)^n = 625$

➔ $m = -1$

$\therefore$ $x^{-1}y^2 = 625$ i.e. $\frac{y^2}{x} = 625$

35. A

$$u = w + \frac{1}{w} = \frac{\alpha+i}{\alpha-i} + \frac{\alpha-i}{\alpha+i}$$

$$= \frac{(\alpha+i)^2+(\alpha-i)^2}{(\alpha-i)(\alpha+i)}$$

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

$$= \frac{2\alpha^2-2}{\alpha^2+1}$$

∴ I is true.

$$v = w - \frac{1}{w} = \frac{\alpha+i}{\alpha-i} - \frac{\alpha-i}{\alpha+i}$$

$$= \frac{(\alpha+i)^2-(\alpha-i)^2}{(\alpha-i)(\alpha+i)}$$

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

$$= \frac{4\alpha i}{\alpha^2+1}$$

∴ II is true.

$$w = \frac{\alpha+i}{\alpha-i}$$

$$= \frac{(\alpha+i)^2}{(\alpha-i)(\alpha+i)}$$

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

$$2w = \frac{2(\alpha^2-1)}{\alpha^2+1} + \frac{4\alpha}{\alpha^2+1}i$$

∴ III is not true.

36. A

Let t be the common ratio. Then, $q = pt$, $r = pt^2$ and $s = pt^3$.

$= p(pt^3) = p^2t^3$

$qr = (pt)(pt^2) = p^2t^3$

i.e. $ps = qr$

∴ I is true.

$p + s = p + pt^3$

$q + r = pt + pt^2$

∴ II may not be true.

∵ $p < q < r < s$ only when $t > 1$.

∴ III may not be true.

37. B

$\Delta \leq 0$

➔ $k^2 - 4(1)(k+8) \leq 0$

$k^2 - 4k - 32 \leq 0$

$(k-8)(k+4) \leq 0$

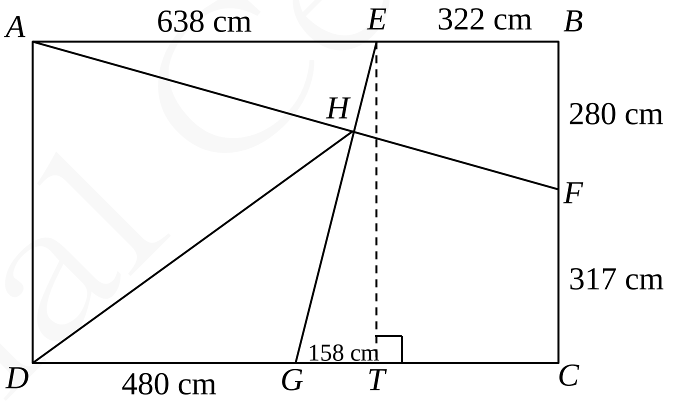
$-4 \leq k \leq 8$

38. B

Let T be the foot of the perpendicular line from E to CD. Then, $ET = BC = 597$ cm.

$BE = AB - AE = 960 - 638 = 322$ cm

$GT = CG - BE = 480 - 322 = 158$ cm



$\tan\angle EGT = \frac{ET}{GT} = \frac{597}{158}$

$\angle EGT = \tan^{-1}\left(\frac{597}{158}\right) \approx 75.17615796^\circ$

$\angle AEG = \angle EGT$ (alt. $\angle$s, $AB//CD$)

$\approx 75.17615796^\circ$

$\tan\angle AFB = \frac{AB}{BF} = \frac{960}{280}$

$\angle AFB = \tan^{-1}\left(\frac{960}{280}\right) \approx 73.73979529^\circ$

$\angle HAD = \angle AFB$ (alt. $\angle$s, $AB//CD$)

$\approx 73.73979529^\circ$

$\angle FAB + \angle AFB + \angle ABF = 180^\circ$ ($\angle$ sum of $\triangle$)

$\angle FAB + 73.73979529^\circ + 90^\circ = 180^\circ$

$\angle FAB \approx 16.26020471^\circ$

$\angle AHE + \angle AEH + \angle HAE = 180^\circ$ ($\angle$ sum of $\triangle$)

$\angle AHE + 75.17615796^\circ + 16.26020471^\circ = 180^\circ$

$\angle AHE \approx 88.56363733^\circ$

By sine formula,

$$\frac{AH}{\sin\angle AEH} = \frac{AE}{\sin\angle AHE}$$

$$\frac{AH}{\sin 75.17615796^\circ} = \frac{638}{\sin 88.56363733^\circ}$$

$AH \approx 616.9593106$ cm

By cosine formula,

$DH^2 = AD^2 + AH^2 - 2(AD)(AH)\cos\angle HAD$

$\approx 597^2 + (616.9593106)^2 + 2(597)(616.9593106)\cos 73.73979529^\circ$

$DH \approx 728.5505845$ cm

≈ 729 cm

39. D

Join AD.

$\angle CAD = \angle CDF = 49^o$ ($\angle$ in alt. segment)

$\angle CDA = 90^o$ ($\angle$ in semi-circle)

$\angle DCE + \angle CED = \angle CDF$ (ext. $\angle$ of $\triangle$)

$\angle DCE + 31^o = 49^o$

$\angle DCE = 18^o$

$\angle ACD + \angle CDA + \angle CAD = 180^o$ ($\angle$ sum of $\triangle$)

$(\angle ECA + \angle DCE) + \angle CDA + \angle CAD = 180^o$

$\angle ECA + 18^o + 90^o + 49^o = 180^o$

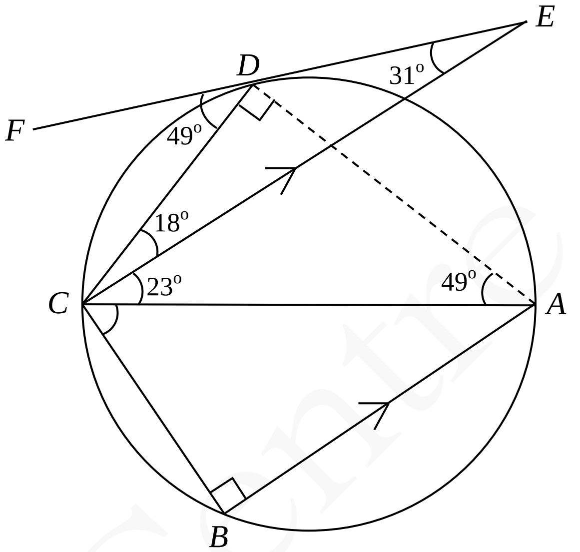
$\angle ECA = 23^o$

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

$\angle ACB + \angle ECA + \angle ABC = 180^o$ (int. $\angle$s, AB // EC)

$\angle ACB + 23^o + 90^o = 180^o$

$\angle ACB = 67^o$



40. A

$$\begin{cases} 4x = 3y \text{ i.e. } y = \frac{4}{3}x \ \ldots (1) \\ x^2 + y^2 - 4x - 22y + 75 = 0 \ \ldots (2) \end{cases}$$

Substitute (1) into (2),

$x^2 + (\frac{4}{3}x)^2 - 4x - 22(\frac{4}{3}x) + 75 = 0$

$x^2 - 12x + 27 = 0$

$(x - 3)(x - 9) = 0$

$x = 3$ or 9

When $x = 3$, $y = 4$.

When $x = 9$, $y = 12$.

The centre of the required circle is the mid-point of (3, 4) and (9, 12). i.e. $(\frac{3+9}{2}, \frac{4+12}{2}) = (6, 8)$

Radius of the required circle = $\frac{\sqrt{(9-3)^2+(12-4)^2}}{2} = 5$

The equation of the required circle is $(x - 6)^2 + (y - 8)^2 = 5^2$.

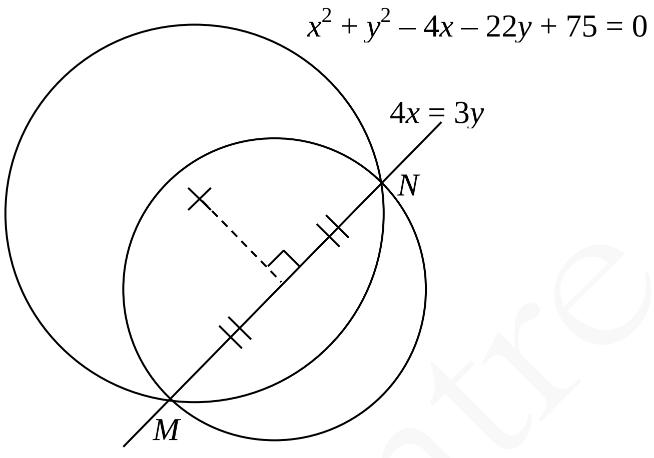
Alternatively

Let L be the line joining the centre of the circle $x^2 + y^2 - 4x - 22y + 75 = 0$ and the mid-point of MN.

Note that $L \perp MN$ and bisects MN. Therefore, the slope of L × the slope of $MN = -1$

i.e. $m_L \times \frac{4}{3} = -1$ ➔ $m_L = -\frac{3}{4}$

Centre of the circle $x^2 + y^2 - 4x - 22y + 75 = 0 = (-\frac{-4}{2}, -\frac{-22}{2}) = (2, 11)$



Let the equation of L be $y = -\frac{3}{4}x + c$.

Substitute (2, 11) into the equation of L,

$11 = -\frac{3}{4}(2) + c$

$c = \frac{25}{2}$

i.e. The equation of L is $y = -\frac{3}{4}x + \frac{25}{2}$.

$y = \frac{4}{3}x$ … (1)

$y = -\frac{3}{4}x + \frac{25}{2}$ … (2)

Solving (1) and (2), we get the intersection of the straight lines to be (6, 8) which is the centre of the required circle.

Distance between (6, 8) and (2, 11) = $\sqrt{(6-2)^2 + (11-8)^2}$ = 5

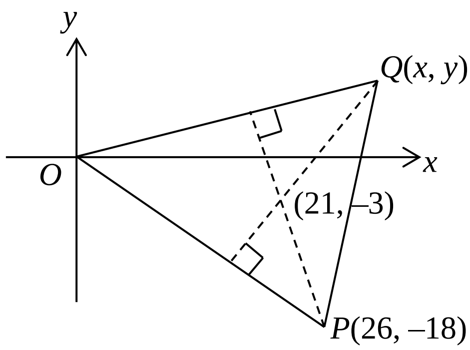
Radius of the circle $x^2 + y^2 - 4x - 22y + 75 = 0$ is $\sqrt{2^2 + 11^2 - 75} = \sqrt{50}$

By Pythagoras' Theorem,

The radius of the required circle = $\sqrt{50 - 5^2}$ = 5

∴ The equation of the required circle is $(x - 6)^2 + (y - 8)^2 = 5^2$.

41. C



Let $Q = (x, y)$.

Then, $\frac{y-(-3)}{x-21} \times \frac{-18-0}{26-0} = -1$ i.e. $13x - 9y - 300 = 0$ … (1)

and $\frac{y-0}{x-0} \times \frac{-18-(-3)}{26-21} = -1$ i.e. $x - 3y = 0$ … (2)

Solving (1) and (2),

$x = 30$ and $y = 10$

42. D

Number of choirs = $C_4^{20} \times C_3^{10} + C_5^{20} \times C_2^{10} + C_6^{20} \times C_1^{10} + C_7^{20}$

= 1 744 200

43. D

The required probability

$= \frac{5}{15} + \frac{10}{15} \times \frac{5}{14} + \frac{10}{15} \times \frac{9}{14} \times \frac{5}{13}$

$= \frac{67}{91}$

44. C

Let σ be the standard deviation of the examination scores.

$\frac{25-45}{\sigma} = -5$

σ = 4

Let x be the girl's examination score.

$\frac{x-45}{4} = 7$

$x = 73$

45. B

Let d be the common difference of the arithmetic sequence.

For $d < 0$, $x_1 > x_2$.

∴ I may not be true.

T(49) – T(1) = 48d

T(99) – T(51) = 48d = T(49) – T(1)

∴ $y_1 = y_2$ i.e. II must be true.

Since T(n) is an arithmetic sequence, $z_1 = z_2$.

∴ III may not be true.