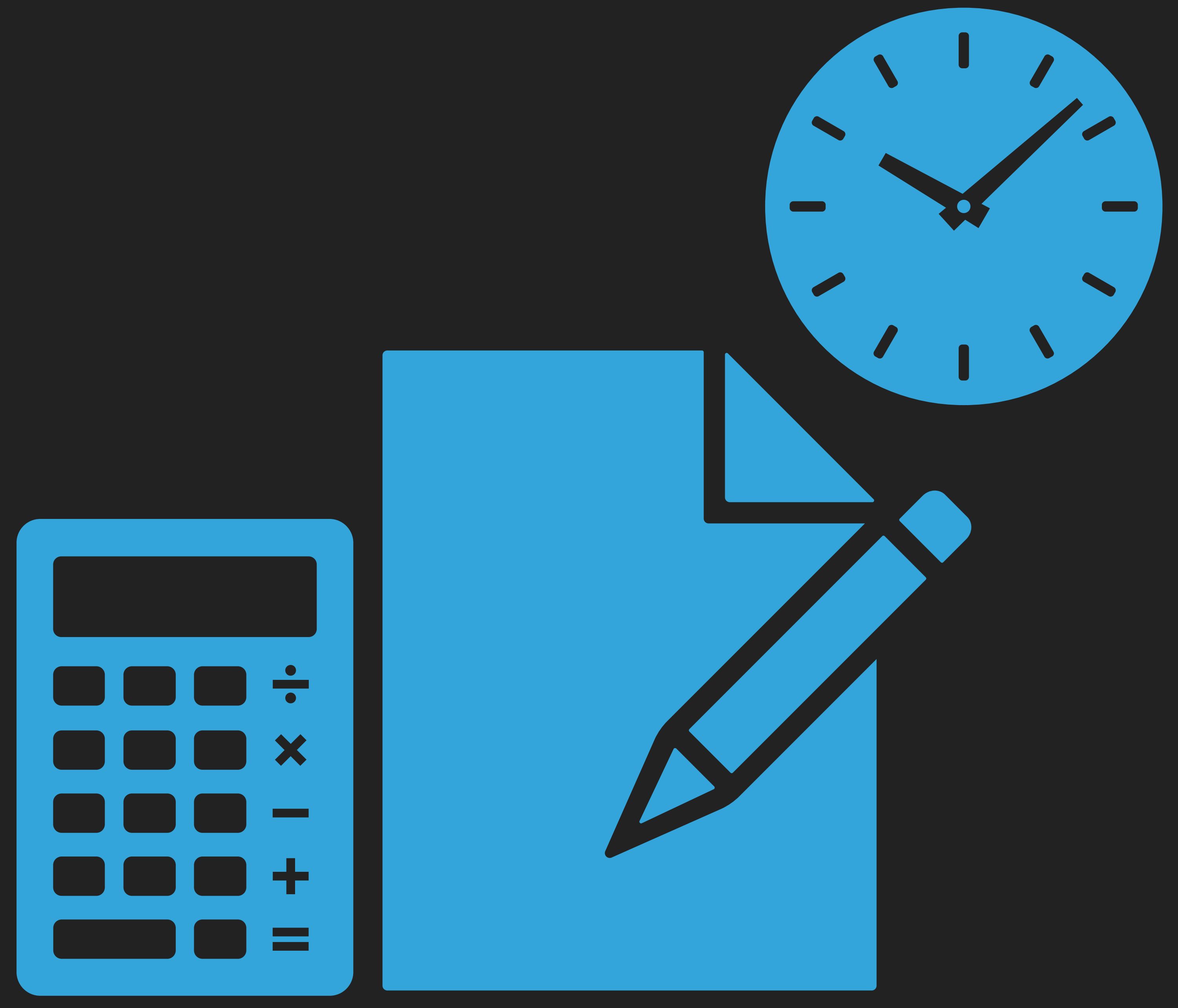
深宵教室 - DSE 必修模擬試題解答

2019 PAPER 1

此為參考2019試題之模擬試題，原版請另行購買

2019 PAPER 1

- Section A1
- Section A2
- Section B



2019 PAPER 1 - SECTION A1

$Q1.)\ 9(h+6k)=7h+8,\ h=?$

* 參考課程 2.1

$\rightarrow 9h+54k=7h+8$

$\rightarrow 2h=8-54k$ * 兩邊減 7h

$\rightarrow h=4-27k$ * 兩邊除 2

2019 PAPER 1 - SECTION A1

Q2.) Simplified $\dfrac{3}{7x-6} - \dfrac{2}{5x-4}$

* 參考課程 2.10

$$= \frac{3(5x-4) - 2(7x-6)}{(7x-6)(5x-4)}$$

$$= \frac{x}{(7x-6)(5x-4)}$$

* (7x-6), (5x-4) 通分母

2019 PAPER 1 - SECTION A1

Q3.) The dimension of rectangle is 24cm x $(13 + r)$cm . The diagonal of the rectangle = $(17 - 3r)$cm, find r .

* 參考課程 2.6 及 3.2

$$24^2 + (13 + r)^2 = (17 - 3r)^2 \ (pyth\ .\ theorem)$$

$$\rightarrow 24^2 + 13^2 + 26r + r^2 = 17^2 - 102r + 9r^2$$

$$\rightarrow r^2 - 16r - 57 = 0$$

$$\rightarrow r = 19 \text{ or } r = -3$$

When $r = 19$, *the diagonal* $= 17 - 3(19) = -40 < 0$

$$\therefore r = -3$$

* 畢氏定理

* 恒等式 $(a + b)^2 \equiv a^2 + 2ab + b^2$

* 恒等式 $(a - b)^2 \equiv a^2 - 2ab + b^2$

* 用二次方程根公式

2019 PAPER 1 - SECTION A1

Q4.) Factorize $4m^2 - 9 - 2m^2n - 7mn + 15n$

* 參考課程 2.5

$= (2m+3)(2m-3) - n(2m^2 + 7m - 15)$

$= (2m+3)(2m-3) - n(2m-3)(m+5)$

$= (2m-3)(2m+3-mn-5n)$

* 恆等式 $a^2 - b^2 = (a-b)(a+b)$
* 抽 -n
* 十字相乘

2019 PAPER 1 - SECTION A1

Q7.) The selling price of good A = \$690 with 25 % discount on marked price . The percentage profit = 15 % . Find the marked price and the cost of good A .

* 參考課程 2.3

Let the marked price of good A be \$M
the cost of good A be \$C

$$\text{Then, } M(1-25\%) = 690 \rightarrow M = 920$$

$$\frac{690-C}{C} x100\,\% = 15\,\% \rightarrow C = 600$$

i . e . The marked price = \$920
The cost = \$600

* 折扣後的售價
* 百份比變化 = (新值 - 舊值) x 100% / 舊值

2019 PAPER 1 - SECTION A1

Q6.) Solve $\dfrac{7x+26}{4} \le 2(3x-1)$ *and* $45-5x \ge 0$

Hence, find the number of integers satisfy the above inequalities .

* 參考課程 1.1 及 2.3

$\rightarrow 7x + 26 \le 24x - 8 \text{ and } 5x \le 45$

$\rightarrow 17x \ge 34 \text{ and } x \le 9$

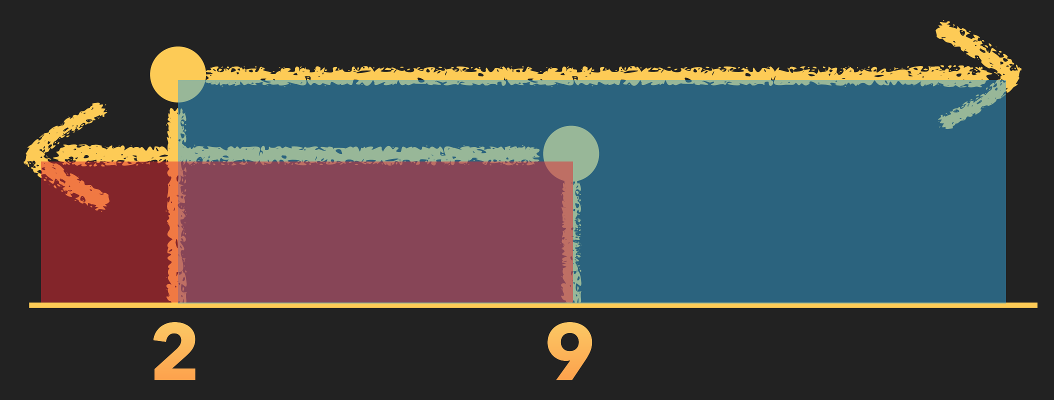
$\rightarrow x \ge 2 \text{ and } x \le 9$

$\rightarrow 2 \le x \le 9$

$\therefore$ *The integer satisfy the inequalities are* 2,3,4,5,6,7,8,9

i . e . There is 8 *number of integer satisfy the inequalities .*

* and 指有重疊的地方



2019 PAPER 1 - SECTION A1

Q7.) In a classroom, the ratio of the number of boys to that of girls $= 13 : 6$.
After 9 boys and 24 girls enter to the classroom, the updated ratio $= 8 : 7$. *Find the original number of boys in the classroom .*

* 參考課程 1.3 及 2.3

Let the original number of boy be B
the original number of girl be G

$$\begin{cases} \boxed{B : G} = \boxed{13 : 6} \text{ ——— } (1) \\ \boxed{B + 9 : G + 24} = \boxed{8 : 7} \text{ —— } (2) \end{cases} \rightarrow \begin{cases} \boxed{\frac{B}{G}} = \boxed{\frac{13}{6}} \text{ ——— } (1) \\ \boxed{\frac{B+9}{G+24}} = \boxed{\frac{8}{7}} \text{ —— } (2) \end{cases}$$

$$\text{In } (1) : \ G = \frac{6B}{13}, \text{ sub into } (2)$$

$$\text{Then } \frac{B+9}{\frac{6B}{13}+24} = \frac{8}{7} \rightarrow 7(B+9) = 8\left(\frac{6B}{13}+24\right) \rightarrow B = 39$$

$\therefore$ *The original number of boys is 39.*

* $\boxed{}$ a:b = a/b

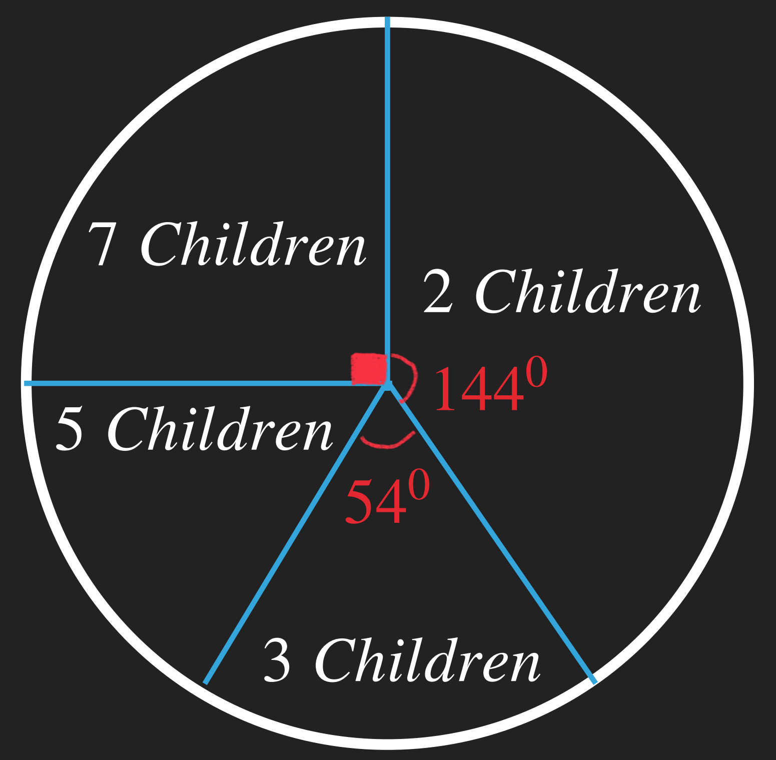
* 用代入法, 用 B 代表 G 再代入 (2) 搵 B

2019 PAPER 1 - SECTION A1

Q8.) The following shows the numbers of children owned by family in a group .

a.) Find the mode and the mean of distribution .

b.) Find the probability of the ramdomly selected family have more than 3 children .



* 參考課程 4.1, 4.2 及 4.3

$$a.)\ The\ mode = 2$$

$$The\ mean = \frac{144(2) + 90(7) + 54(3) + (360 - 144 - 90 - 54)(5)}{360}$$

$$= 4$$

$$b.)\ The\ probability = \frac{90^0 + (360^0 - 144^0 - 54^0 - 90^0)}{360^0} = 0.45$$

* 眾數 = 出現最多

* 平均值 = 數值總和 / 總數

* 圓形圖內角度比例 = 人數比例

2019 PAPER 1 - SECTION A1

Q9.) The sum of the volumes of 2 spheres $= 324\pi cm^3$ *. The radius of the larger sphere = the diameter of the smaller sphere .*

a.) Find the volume of larger sphere in terms of π

b.) Find the sum of the surface area in terms of π *.*

* 參考課程 3.9

a.) Let r cm be the radius of the smaller sphere

R cm be the radius of the larger sphere

$$\text{Then, } R = 2r \text{ and } 324\pi = \boxed{\frac{4}{3}\pi R^3} + \boxed{\frac{4}{3}\pi r^3} \rightarrow 324 = \frac{4}{3}(9r^3) \rightarrow r = 3$$

$$\text{Then, the volume of larger sphere} = \boxed{\frac{4}{3}\pi R^3} = \frac{4}{3}\pi(8r^3) = 288\pi\ cm^3$$

$$\text{b.) The sum of surface area} = \boxed{4\pi R^2} + \boxed{4\pi r^2} = 4\pi(36+9)$$

$$= 180\pi\ cm^2$$

* 球體體積 = 4/3 x 半徑³ x π

* 球體表面面積 = 4x 半徑² xπ

2019 PAPER 1 - SECTION A2

Q10.) Given that $f(x)$ is partly constant and partly varies as x. $f(-2) = -96$ and $f(5) = 72$.

a.) Find $f(x)$.

b.) Solve $f(x) = 3x^2$.

* 參考課程 2.3, 2.4, 2.5 及 2.6

a.) Let $f(x) = k_1 + k_2 x$, where k_1, k_2 are real constant. Then,

$$\begin{cases} k_1 - 2k_2 = -96 \quad \text{———} \quad (1) \\ k_1 + 5k_2 = 72 \quad \text{———} \quad (2) \end{cases}$$

$$(2) - (1): \; k_2 = 24 \rightarrow k_1 = -48$$

$$\therefore f(x) = 24x - 48$$

b.) $f(x) = 3x^2 \rightarrow x^2 - 8x + 16 = 0$

$\rightarrow (x-4)^2 = 0$

$\rightarrow x = 4$ (repeated)

* 部分變量

* 消去法消去 k_1 搵 k_2,再代 (1) 式搵 k_1

* 恆等式 $(a-b)^2 \equiv a^2 - 2ab + b^2$

2019 PAPER 1 - SECTION A2

Q11.) Let $f(x)$ be a cubic polynomial. The remainder $= 50$ if $f(x)$ is divided by $x-1$. The reminder $= -52$ if $f(x)$ is divided by $x+2$. Given that $2x^2+9x+14$ is one of $f(x)$ factor.

a.) Find the quotient when $f(x)$ is divided by $2x^2+9x+14$.

b.) How many rational roots does $f(x)=0$ have? Explain your answer.

* 參考課程 1.1, 2.4 及 2.6

a.) Given that $f(1)=50$ and $f(-2)=-52$

Let $f(x)=(Ax+B)(2x^2+9x+14)$, where A and B are costant.

$$\begin{cases} A+B=2 & \text{———— (1)} \\ -2A+B=-13 & \text{———— (2)} \end{cases}$$

$(1)-(2)$: $A=5$ and $B=-3$

i.e. The quotient $=5x-3$

b.) $f(x)=0 \rightarrow (5x-3)(2x^2+9x+14)=0$

$\rightarrow x=0.6$ or $2x^2+9x+14=0 \quad -(*)$

In $(*)$, $\Delta=9^2-4(2)(14)=-31<0$, There is no real root

i.e. $f(x)=0$ has 1 rational root.

* 餘數定理

* 消去法, 用 (1) 式減 (2) 式約去 B 搵 A, 再代入 (1) 式搵 B

* 用二次方程判別式

2019 PAPER 1 - SECTION A2

Q12.) The stem – and – leaf diagram below shows the time (min.) used in study of som boys .

Stem (tens)	Leaf (units)
5	a
6	0 0 3 c c 8 9 9 9
7	0 1 1 1 2 2 5 6 9
8	b

Given that the inter – quartile range is 8 min .

a.) Find c .

b.) If the range > 34 min . and mean = 69 min . Find a, b, and the least possible standard deviation of the distribution .

* 參考課程 4.1 及 4.2

a.) The inter – quartile range $= 72 - (60 + c) = 8 \rightarrow c = 4$

b.) The range $> 34 \rightarrow (80 + b) - (50 + a) > 34 \rightarrow b - a > 4 \quad -(1)$

The mean $= 69 \rightarrow \dfrac{(50 + a) + (80 + b) + 1243}{20} = 69$

* 四分位距 = 第一及三四分位數之差

* 全距 = 最大值 - 最細值

* 平均值 = 加總 / 總數量

CONT'D

2019 PAPER 1 - SECTION A2

$$\rightarrow a + b = 7 \quad -(2)$$

$In\ (2): b = 7 - a,\ Sub\ into\ (1),\ we\ have,\ 7 - 2a > 4$

$$\rightarrow a < 1.5$$

$\therefore\ The\ possible\ value\ of\ a = 0, 1, (\because a \geq 0)$

$i.e.\ The\ possible\ value\ of\ (a, b) = (0, 7)\ and\ (1, 6)$

$Let\ \sigma(a, b)\ be\ the\ standard\ deviation\ function\ of\ a\ and\ b$

$$\sigma(a, b) = \frac{1}{20}\sqrt{(50 + a - 69)^2 + (80 + b - 69)^2 + 465}$$

$Hence,\ 20\sigma^2(0,7) = 1150,\ and\ 20\sigma^2(1,6) = 1078$

$i.e.\ The\ least\ possible\ standard\ deviation = \sigma(1,6)$

$$= 7.34\ min\ (to\ 3\ sig.fig)$$

* 用代入法, 將 (2) 代入 (1) 式搵 a 範圍, 再代入 (2) 式搵 b 範圍

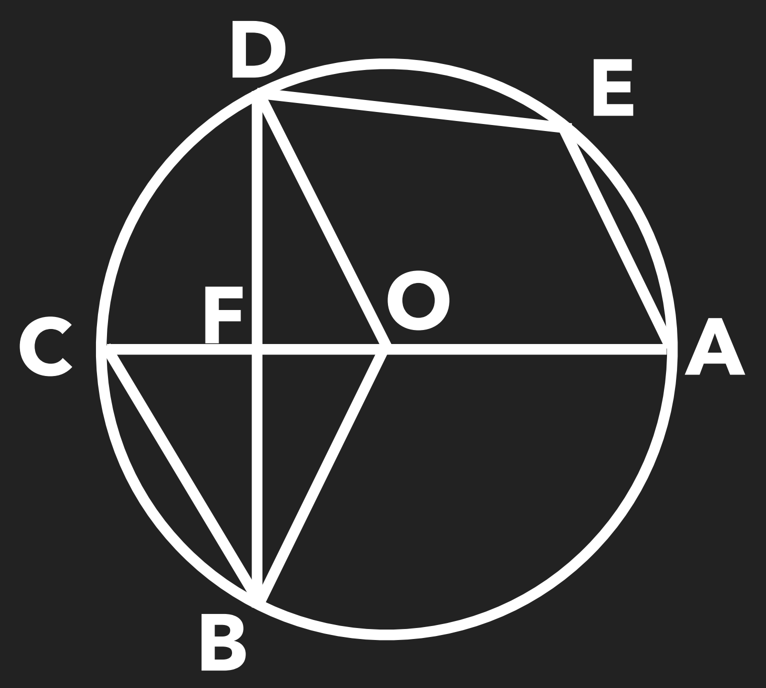
* 標準分數 = 數據相差平均數幾多個標準差

2019 PAPER 1 - SECTION A2

Q13.) In the following, AC is diameter and $\angle AED = 115^0$.

a.) Find $\angle CBF$.

b.) If $BC//OD$ and $OB = 18cm$, is the perimeter of the sector $OBC < 60cm$? Explain your answer.



* 參考課程 3.1, 3.2 及 3.6

* 扇形面積 = 角度比例 x 圓形面積

a.) $\angle CEA = 90^0$ ($\angle$ in semi circle)

$\angle CBF = \angle DEC = 115^0 - 90^0$ ($\angle$s in the same segment)

$= 25^0$

b.) $OD = OC = OB = 18cm$ (radius of the circle)

$\angle ODB = \angle CBF = 25^0$ (alt $\angle$s $OD//BC$)

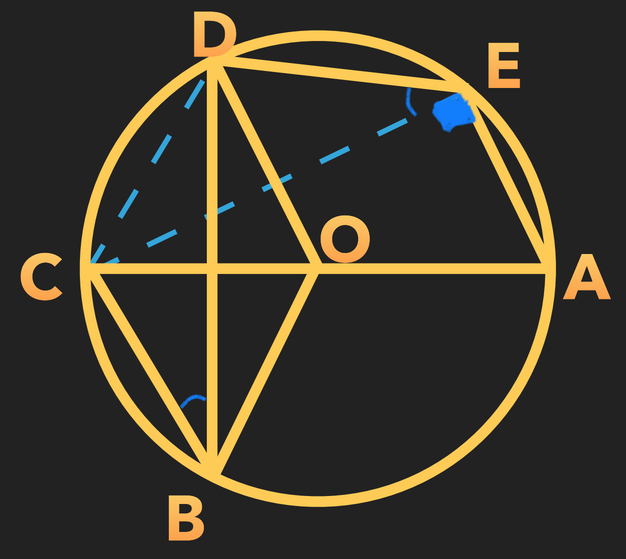
$\angle OBD = \angle ODB = 25^0$ (base $\angle$s of isos. ΔODB)

$\angle OCB = \angle OBC = 25^0 + 25^0 = 50^0$ (base $\angle$s of isos. ΔOCB)

$\angle BOC = 180^0 - 2(50^0) = 80^0$ ($\angle$s sum of Δ)

* 直徑圓周角 = 90^0

* 同弓內圓周角相等



* 平行線內錯角

* 等腰三角形底角相等

* 三角形內角和 = 180^0

CONT'D

2019 PAPER 1 - SECTION A2

$$\therefore \text{The perimeter of the sector } OBC = 2(18) + \boxed{\frac{80^0}{360^0} 2\pi(18)}$$

$$\approx 61.132\ cm > 60cm$$

i.e. The perimeter of the sector OBC > 60cm.

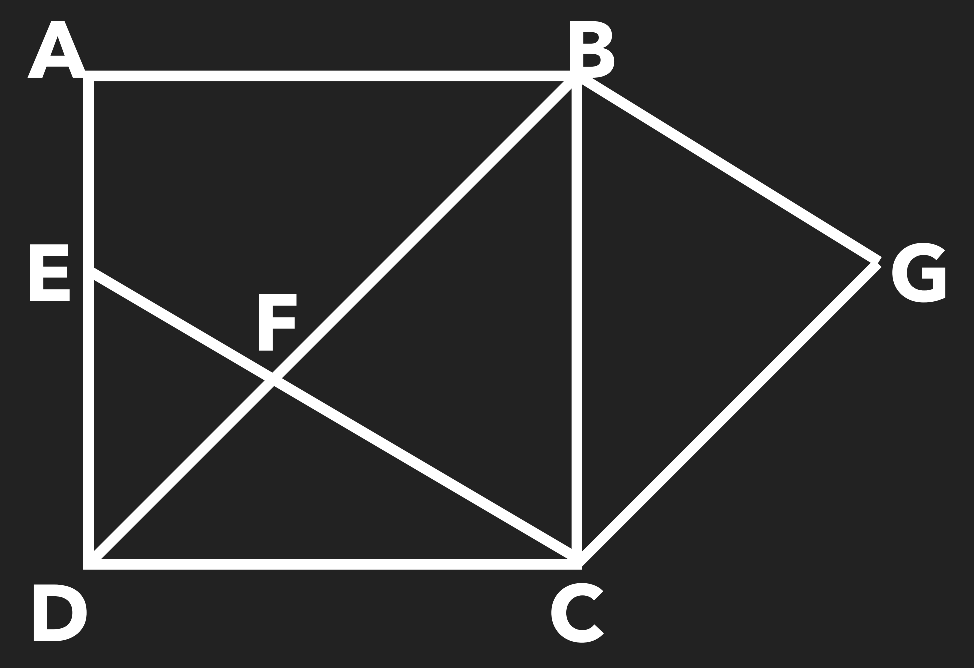
* 扇形周界 = 角度比例 x 圓形周界

2019 PAPER 1 - SECTION A2

Q14.) In the following, ABCD is a square, BG//EC and CG//DB

a.) Prove that $\Delta BCF \sim \Delta DEF$ and $\Delta BCG \cong \Delta CBF$.

b.) Suppose $\angle BCF = \angle BGC$, let $BC = l$, express DF in terms of l, and prove $AE > DF$.



* 參考課程 3.1, 3.2, 3.3 及 3.4

a.) $\angle FBC = \angle FDE = 45^0$ (props . of square)   * 正方形對角線平分直角

$\angle BCF = \angle DEF$ (alt . $\angle$s, BC//ED)   * 平行線內錯角

$\angle BFC = \angle EFD$ (vert . opp . $\angle$s)   * 對頂角

i . e . $\Delta BCF \sim \Delta DEF$ (AAA)

$BC = CB$ (common)   * 共線要寫原因

$\angle GBC = \angle FCB$ (alt . $\angle$s, EC//BG)   * 平行線內錯角

$\angle BCG = \angle CBF$ (alt . $\angle$s, BD//CG)   * 平行線內錯角

i . e . $\Delta BCG \cong \Delta CBF$ (ASA)

CONT'D

2019 PAPER 1 - SECTION A2

b.) $\angle CBG = \angle BCF = \angle BGC$ ($\because \Delta BCG \cong \Delta CBF$)

$\angle GCB = \angle FBC = 45^0$ ($\because \Delta BCG \cong \Delta CBF$)

$\therefore \boxed{\angle BGC = \dfrac{(180^0 - 45^0)}{2}} = 67.5^0$ ($\angle s$ sum of Δ)

Hence, $\angle ECD = 90^0 - \angle BCF = 22.5^0$, then, $ED = l\tan(22.5^0)$

$\because \Delta BCG \cong \Delta CBF$ and $\Delta BCF \sim \Delta DEF$

$\rightarrow \Delta CBG \sim \Delta DEF$, hence, $\angle DEF = \angle DFE = \angle CBG = \angle CGB$

i.e., $\boxed{DF = ED}$ (base $\angle s$ of isos. ΔDEF)

$= l \cdot \tan(22.5^0)$

Consider, $\dfrac{AE}{DF} = \dfrac{l - DE}{DF} = \dfrac{l - DF}{DF} = \dfrac{1 - \tan(22.5^0)}{\tan(22.5^0)} \approx 1.41 > 1$

$\rightarrow AE > DF$

* 三角形內角和 = 180⁰

* 等腰三角形底角相等

2019 PAPER 1 – SECTION B

Q15.) There are 21 red balls and 11 blue balls in the bag . 5 balls are randomly selected from from the bag . Find the number of combination at least 1 red balls in the selection .

* 參考課程 4.4

$$\text{The number of combinsation, } C_1 = \boxed{C_5^{32}}$$

$$\text{The number of combinsation with no red ball, } C_2 = \boxed{C_5^{11}}$$

$$\text{The number of combination at least 1 red ball} = C_1 - C_2$$

$$= 200{,}914$$

* 32 個波當中要 5 個組合

* 無紅波組合 = 11 個藍波當中要 5 個組合

2019 PAPER 1 - SECTION B

Q16.) The 1^{st} and the 2^{nd} term of an arithmetic sequence are $\log A$ and $\log B$ respectively. where $B = 5A - 18$ and $B = A^2 - 13A + 63$. Find the least value of n such that the sum of the first n terms of the sequence is greatest than 888.

* 參考課程 2.2, 2.6 及 2.7

Let $T(n) = a + (n-1)d$, where a and d are constant

$T(1) = a = \log A$

$T(2) = a + d \rightarrow \log A + d = \log B \rightarrow d = \log B - \log A$

Also, given that

$$\begin{cases} B = 5A - 18 & \text{——— (1)} \\ B = A^2 - 13A + 63 & \text{——— (2)} \end{cases}$$

$(2) - (1): A^2 - 18A + 81 = 0 \rightarrow (A-9)^2 = 0$

$\rightarrow A = 9$ (repeated), then $B = 27$

Hence, $T(n) = \log 9 - (n-1)(\log 9 - \log 3)$

* 等差數列 = 首項 + (項數-1) x 公差

* (2) - (1) 搵 A 再代 (1) 搵 B

* 恆等式 $(a-b)^2 \equiv a^2 - 2ab + b^2$

CONT'D

2019 PAPER 1 - SECTION B

$$\rightarrow T(n) = log3^2 + (n-1)(log3^2 - log3)$$
$$= 2log3 + (n-1)(2log3 - log3) = (n+1)log3$$

$$Consider,\ T(1) + T(2) + \ldots + T(n) > 888\ and\ n \geq 1$$
$$\rightarrow (2 + 3 + \ldots + (n+1))log3 > 888\ and\ n \geq 1$$
$$\rightarrow \frac{n(n+3)}{2} > \frac{888}{log3}\ and\ n \geq 1$$
$$\rightarrow n^2 + 3n - \frac{1776}{log3} > 0\ and\ n \geq 1$$
$$\rightarrow n > \frac{-3 + \sqrt{9 + \frac{7104}{log3}}}{2} \approx 59.52$$

$\therefore$ *The greatest value of* $n = 60$

* log A^n = nlogA

* 等差數列之和 = (首項 + 尾項)(項數/2)

* 先解二次方程搵根, α, β
因為大過0, 所以答案細過最細或大過最大根

2019 PAPER 1 - SECTION B

Q17.) Let a and p be the area and perimeter of ΔCDE respectively. Assume $r =$ radius of the inscribed circle of ΔCDE.

a.) Prove $pr = 2a$.

b.) Let $H = (9,12)$ and $K = (14,0)$. Assume P is a moving point such that the perpendicular distance from P to $OH =$ that from P to HK, where $O = (0,0)$. Find the equation of locus of P.

* 參考課程 3.2, 3.7 及 3.8

a.) Let the center of the inscribed circle be X.

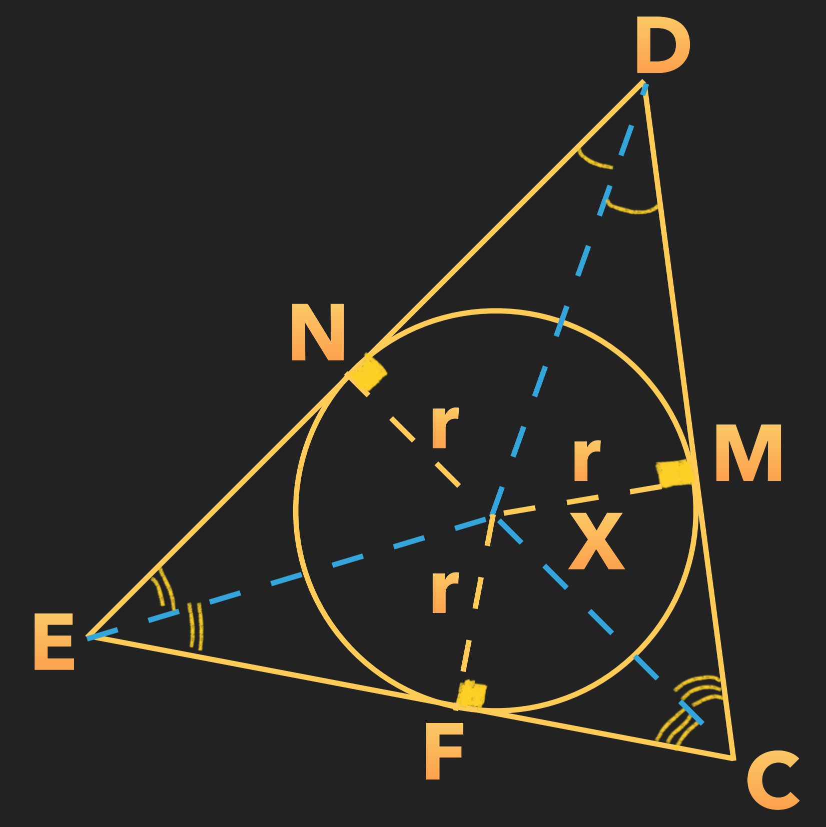
M, N, F be the pts. on CD, DE and CE such that

$XM \perp CD$, $XN \perp DE$ and $XF \perp CE$

$XM = XN = XF = r$ (tangent $\perp$ radius)

$$a = \frac{CD \cdot r}{2} + \frac{DE \cdot r}{2} + \frac{CE \cdot r}{2} = \frac{1}{2}(CD + DE + CE)r$$

$\therefore pr = 2a$



* 圓心到切點的最短距離 = 半徑

CONT'D

2019 PAPER 1 - SECTION B

b.) Let $C(h, r)$ be the center of inscribed circle of ΔOHK.

L be locus of P

Obviously, C and H lie on L

Meanwhile,

$$OH = \sqrt{(9-0)^2 + (12-0)^2} = 15, \quad OK = 14$$

$$HK = \sqrt{(14-9)^2 + (12-0)^2} = 13$$

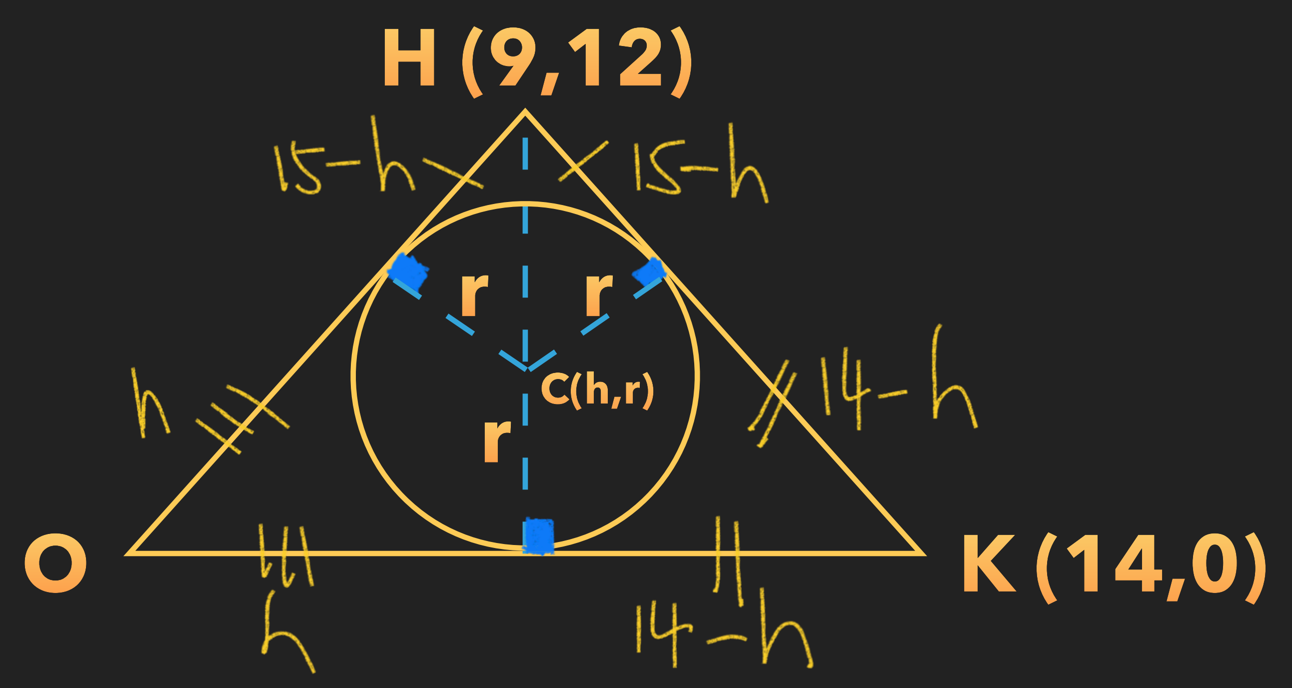
$$\text{The area of } \Delta OHK = \frac{1}{2}(12)(14) = 84$$

$$\text{From a.) } (OH + OK + HK)r = 2(84) \rightarrow r = 4$$

$$\text{Also, } (15-h) + (14-h) = 13 \ (\text{tangent props})$$

$$\rightarrow h = 8$$

* 距離公式 = $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$



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2019 PAPER 1 - SECTION B

$$Hence,\ by\ two-pts.\ form.\ (C\ and\ H)$$

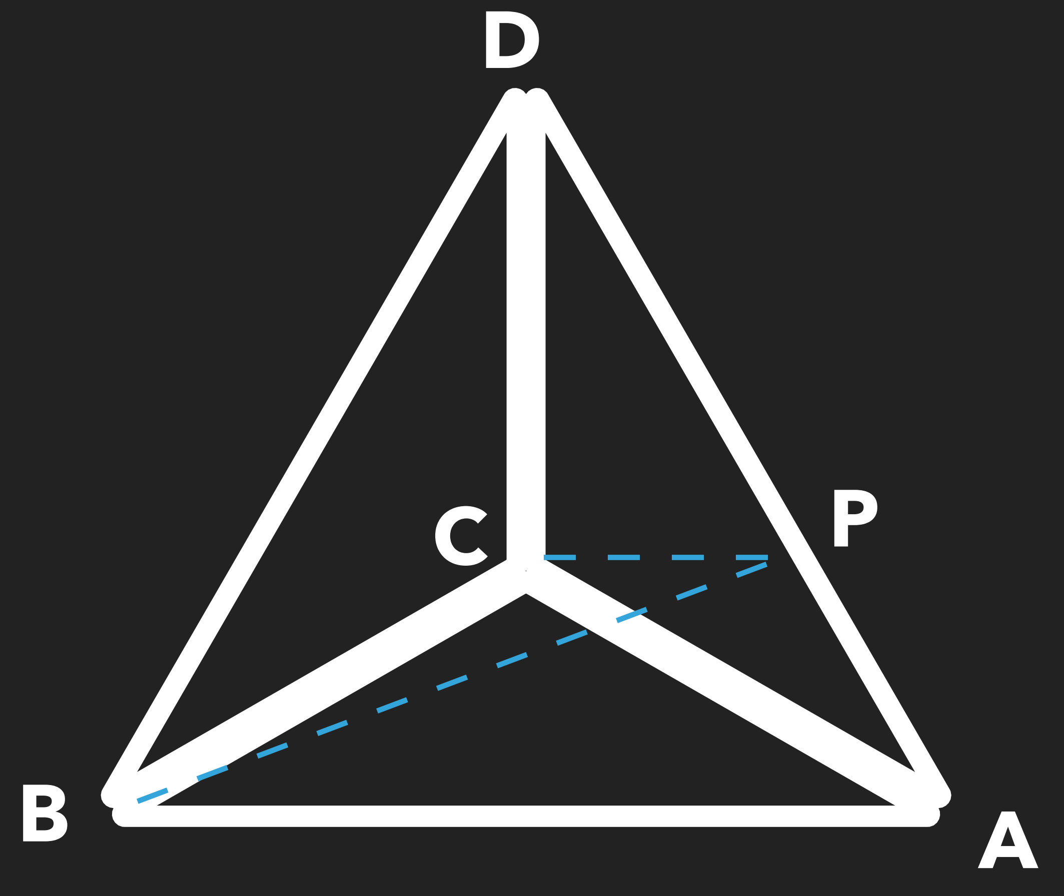
$$L:\ \boxed{\frac{y-4}{x-8}=\frac{12-8}{9-8}}$$

$$\therefore L:\ y=8x-60$$

* 直線函數 = 兩點公式

2019 PAPER 1 – SECTION B

Q18.) In the following, $ABCD$ is a tetrahedron. Given that $BP \perp AD$, $\angle ABD = 72^0$, $AC = AD = CD = 13cm$, $BC = 8cm$ and $BD = 12cm$.



a.) Find $\angle BAD$ and CP.

b.) Is the angle between the plane ABD and the plane ACD $= \angle BPC$? Explain your answer.

* 參考課程 3.3, 3.4 及 3.10

a.) By sine law in ΔADB,

$$\sin\angle BAD = \frac{12\sin72^0}{13} = 61.4^0 \ (to\ 3\ sig.fig.)$$

By cosine law in ΔADB,

$$CP^2 = 13^2 + DP^2 - 2(13)(DP)\cos60^0$$

* sine law 使用

* cosine law 使用

* 等邊三角形特性

CONT'D

2019 PAPER 1 - SECTION B

$where,\ DP = 12\cos\angle BDA$

$\rightarrow CP = 11.4cm\ (to\ 3\ sig.fig)$

$b.)\ \because CP^2 + DP^2 \neq CD^2$

$\therefore CP\ is\ not \perp AD$

$i.e.\ The\ angle\ between\ the\ plane\ ABD\ and\ the\ plane\ ACD$

$\neq \angle BPC.$

* 畢氏定理逆定理

* 面與面夾必須共線兩邊成 90^o

2019 PAPER 1 - SECTION B

$Q19.)$ Assume $f(x) = \dfrac{1}{1+k}[x^2 + (6k-2)x + (9k+25)]$, where $k > 0$. Let $F = (4, 33)$

a.) Is F lies on $y = f(x)$? Explain your answer.

b.) Denote $y = g(x)$ that is obtained by reflecting $y = f(x)$ along y – axis and then moves upwards by 4 units. Let U = the vertex of $y = g(x)$ and $O = (0, 0)$.

i.) Find U in term of k.

ii.) Find k such that the area of the circle passing through F, O and U is the least.

Given that there is a point G which always lies on $y = g(x)$ for any positive constant k. Are F, O, U and G concyclic? Explain your answer.

* 參考課程 2.1, 2.5, 2.6, 2.10, 3.6 及 3.10

$$a.) \quad \because f(4) = \frac{1}{1+k}(16 + 24k - 8 + 9k + 25) = 33$$

$\therefore F$ lies on $y = f(x)$

* 將 F 代入 y = f(x), 查看是否符合

CONT'D

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$$bi.)\ Let\ f(-x)+4 \equiv \frac{1}{1+k}(x-a)^2+b$$

$$\rightarrow \frac{1}{1+k}[x^2-(6k-2)x+(9k+25)]+4 \equiv \frac{1}{1+k}(x-a)^2+b$$

By compare cofficient of x and constant,

$$\begin{cases} -(6k-2) = -2a \text{ ———— } (1) \\ \dfrac{9k+25}{1+k}+4 = \dfrac{a^2}{1+k}+b \text{ — } (2) \end{cases}$$

$$In\ (1):\ \ a = 3k-1,\ sub\ into\ (2)$$

$$\frac{9k+25}{1+k}+4 = \frac{(3k-1)^2}{1+k}+b \rightarrow b = \frac{(9k+25)-(3k-1)^2}{1+k}+4$$

* 頂點型態轉換, 可用 compare coefficient

* y 軸反射再向上移 4 格

CONT'D

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$$\rightarrow b = \frac{-9k^2 + 19k + 28}{1 + k} = \frac{(1 + k)(-9k + 28)}{1 + k} = 28 - 9k$$

$$\therefore U = (3k - 1, 28 - 9k)$$

bii.) When the area of circle is least, $FO = circle\ diameter$

Then, $FU \perp OU$ ($\angle$ in semi circle)

$$\rightarrow slope\ of\ FO \cdot slope\ of\ OU = -1$$

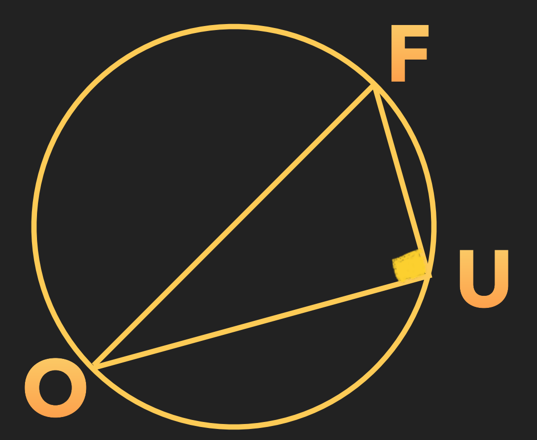
$$\rightarrow \frac{28 - 9k - 33}{3k - 1 - 4} \cdot \frac{28 - 9k}{3k - 1} = -1$$

$$\rightarrow 90k^2 - 225k - 135 = 0$$

$$\rightarrow (2k + 1)(k - 3) = 0$$

$$\rightarrow k = 3\ or\ k = -\frac{1}{2}\ (rejected\ \because k > 0)$$

* 用十字相乘法



* 直徑圓周角成 90^o

* 兩線互相垂直, 斜率相乘 = -1

* 兩點斜率 = $\frac{y_2 - y_1}{x_2 - x_1}$

CONT'D

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$i.e.\ k = 3$

$$\text{Then, the center of the circle, } C = \boxed{\left(\frac{4-0}{2}, \frac{33-0}{2}\right)} = (2, 16.5)$$

$$\text{the radius, } R = \boxed{\sqrt{(2-0)^2 + (16.5-0)^2}} = \sqrt{276.25}$$

$\text{Point } G = $ the reflection of Point F on y – axis and move upwards by 4 units.

$$= (-4, 33+4) = (-4, 37)$$

$$\text{Then } GC = \sqrt{(-4-2)^2 + (37-16.5)^2} = \sqrt{456.25} \neq R$$

$i.e.\ F, O, U$ and G are not concyclic.

* 中點公式 FO
* 距離公式 = $\sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$