

二元一次方程

? → A : ? → B : ? → C : ? → D : ? → X : ? → Y : 24

(CX - BY) ⊥ (AX - BD) ▲ (C - A Ans) ⊥ B ▲ 49

三角形 (mode 5, 1)

ClrStat : ? → A : ? → B : ? → C : ? → D : ? → X : ? → Y : B (C 29

= 0) (DX = 0) (Y = 0 : D Ans ≠ 0, X Ans ≠ 0 π : Σx ⇒ sin⁻¹(A 58

⁻¹ B sin(D → X : Σy ⇒ sin⁻¹(B⁻¹ A sin(X → D : C ⇒ cos⁻¹((A² + B²

- C²) ÷ (2AB → Y : DX ⇒ πᵣ - D - X → Y : X ⇒ πᵣ - X - Y →

D : D ⇒ πᵣ - D - Y → X : B ⇒ √(A² + B² - 2AB cos(Y → C : If 148

DX : Then BC ⇒ Goto 0 : A ÷ sin(D → M : M sin(X → B : M sin(Y →

C : Else cos⁻¹((B² + C² - A²) ÷ (2BC → D : πᵣ - D - Y → X

: Ifend : Lbl 0 : A ▲ B ▲ C ▲ D ▲ X ▲ Y ▲ 2⁻¹ BC sin(D → M ▲ Σx

X > D, Σy D > X π : If minX + minY : Then Abs(D - X → Y : minX ⇒

πᵣ - X → X : minY ⇒ πᵣ - D → D : A sin(Y) ÷ sin(D → C : Goto 0 287

Rainbow (mode 2)

? → A : ? → B : ? → M : -B / √(2A ▲ - (B² - 4AM) ⊥

(4A ▲ - B) ⊥ (2A → B : A B² M : -4AM → C : B + √

- M) ⊥ A → X ▲ 2B - Ans → Y ▲ Abs(C → M : √(C ÷ M) ⊥ (

2A → A : B ▲ 1 : Fix 0 : While Ans : Rnd(√(M ÷ Ans) - . 5

→ B : M ÷ B² → C : Ans - Rnd(Ans ⇒ Rnd(C + . 5 : WhileEnd :

Norm 1 : A B ▲ C 137

LDC T (mode 5, 1)

ClrStat : ? → D : ? → A : ? → B : If D = 2 : Then ? → C : ? → D : ? → M
 : A , B or C , D ; M or : b a x y IfEnd : If D = 1 : Then ? → M :
 M - A M + B IfEnd : If D = 0 : Then ? → C : - A B - C B - C
 A ? → X : ? → Y : B - A - B X + A Y A B - A X - B Y
 IfEnd 131

DCT (mode 2)

? → C : ? → A : ? → B : ? → M : If C = i : Then A B → D : - M
 B → C : ? → M : ? → Y : ? → X : ? → A : X D² - D Y M + : ? → B
 : 2 C D X + B D - A - C Y → Y : ? → A : A + B C + C² X → X : Else
 - A 2 - B 2 √(A² 4 + B² 4 - M → D IfEnd : If C = e :
 Then ? → D : ? → C : - A² + 4 (B C + C² + M → X : - B² + 4 (
 A D + D² + M → M : ^{2AB+8CD+4(AC+BD) → Y} : IfEnd : If C = π : Then ? → M :
 A : A A - Y → X : X 1 → M : Goto 1 : IfEnd : If M : Then Y² - 4
 X M → A : . 5 arg(A + 10⁹(- 9 : Y + 1 < Ans × √(Abs (A : Ans)
 (2 M → A : A C - Ans D → B Y M - A → X : X Else X Y →
 X IfEnd : C - Ans D → Y Lbl 1 : M - M (A + X M A X 329

三角形面積 (mode 2)

? → A : ? → B : ? → C : ? → D : ? → X : ? → Y : ? → M :
 B Y M - M X C : ? → M : Ans + D M C - M Y A : ? → M : Ans
 + A X M - M D B 63

三點找四心 + 圓 eq. (mode 2)

$$\begin{aligned}
 & ? \rightarrow A : ? \rightarrow B : ? \rightarrow C : A + B + C \rightarrow M + M \downarrow 3 \blacktriangle \arg(B - C) \\
 & - \arg(A - C \rightarrow D : C + i(A - B) \tan(90^\circ - D M - \blacktriangle . 5 M \\
 & \rightarrow M \blacktriangle \text{Abs}(B - C) + \text{Abs}(A - C) - \text{Abs}(A - B : C + . 5 \angle \\
 & \arg(\text{conj}(M \blacktriangle (M + \text{conj}(M))^2 \downarrow 4 - (M - \text{conj}(M))^2 \\
 & \downarrow 4 - \text{Abs}(M - A)^2 \quad 140
 \end{aligned}$$

Program 符號

SHIFT 3 : ? \rightarrow : \blacktriangle \Rightarrow = \neq
 $>$ $<$ \geq \leq Goto Lbl
 White White End If Then Else
 IfEnd For To Step Next Break

SHIFT 1 : Σx^2 Σx n Σy^2 Σy Σxy
 $\Sigma x^2 y$ Σx^3 Σx^4

SHIFT 2 , 1 : \bar{x} \bar{y} a b

SHIFT 2 , 2 : min X max X min Y max Y

SHIFT Mode : Deg Rad Gra Fix Sci Norm
 FreqOn FreqOff

SHIFT EXP SHIFT Ans 2 : T^r

M+ : DT

SHIFT 9 , 1 : ClrMemory ClrStat

二元一次方程

(49 bytes)

$$\begin{cases} \underline{a}x + \underline{b}y = \underline{c} \\ \underline{d}x + \underline{e}y = \underline{f} \end{cases}$$

① \wedge a, b, c, d, e, f

② 出 x 答案

③ 出 y 答案

E.g.
$$\begin{cases} x + y = 7 \\ x - y = 1 \end{cases}$$

① \wedge $1, 1, 7, 1, -1, 1$

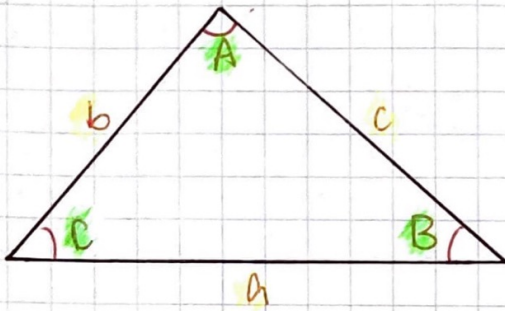
② 出 4

③ 出 3

$\therefore x = 4, y = 3$

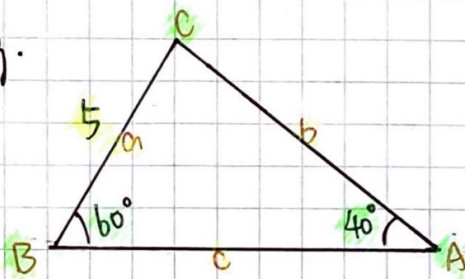


三角形 $3 \rightarrow 3 + 1$ (287 bytes)



有 a, b, c, A, B, C 其中三樣
出 Area + Area

E.g.



* 先入邊長, 再入角度

* 未知數入 0

* 第一個數不可以入 0

① 入 5, 0, 0, 40, 60, 0

a ② 出 5

- A

b ③ 出 6.7365

- B

c ④ 出 7.6604

- C

A ⑤ 出 40

- D

B ⑥ 出 60

- X

C ⑦ 出 80

- Y

Area ⑧ 出 16.5853

- M

} Store to

① $h = \frac{-b}{2a}$ prog 會寫

① = axis of symmetry

② = vertex 嘅 x

② $k = \frac{-b^2 - 4AM}{4A} = \frac{-\Delta}{4A}$ prog 會寫

① = optimum value

② = vertex 嘅 y

$Ax^2 + Bx + C = 0$

$a x^2 + b x + c = 0$

$\Rightarrow a(x-h)^2 + k = 0$ 出 h, k

E.g. $2x^2 + 5x + 7 = 0$

照抄

$2(x + \frac{5}{4})^2 + \frac{31}{8} = 0$
* -- 得 +

爆括號, 由下做上去

$2x^2 + 5x + 7 = 0$ ③
 $2(x^2 + \frac{5}{2}x + \frac{25}{16}) + \frac{31}{8} = 0$ ②
 $2[x^2 + 2(x)(\frac{5}{4}) + (\frac{5}{4})^2] + \frac{31}{8} = 0$
 $2(x + \frac{5}{4})^2 + \frac{31}{8} = 0$ ①

* $(x - \quad)^2 + \quad = 0$
↑
記得 -- 得 +

E.g. $3x^2 + (k-1)x + k^2 = 0$

① k 代 10000

② 照用 Prog. 4

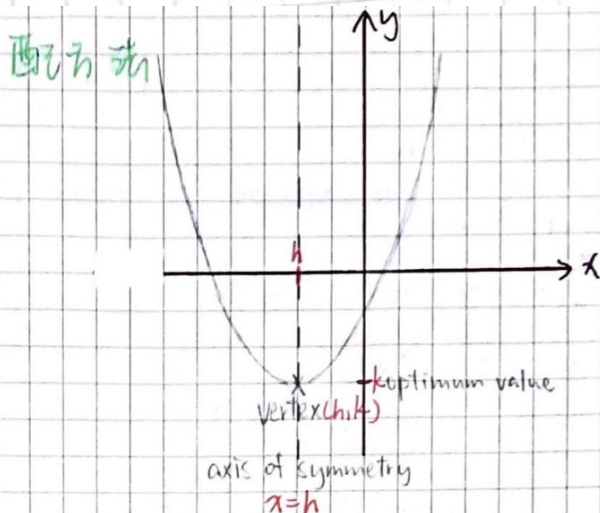
③ 出 $\frac{-3333}{2}$, 9166833.25 (轉唔到分數)

④ 抄 Prog. 上面嘅 formula

$Ax^2 + Bx + C = 0$
↑ ↑ ↑
A B M

⑤ 寫答案

$3 \left[x - \frac{-(k-1)}{2(3)} \right]^2 + \left[\frac{-(k-1)^2 - 4(3)(k^2)}{4(3)} \right] = 0$



③ ④ $\frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ Store roots $\frac{-(-49-72)}{8}$ 出 + 儲存 roots

E.g. $2x^2 - 7x + 9 = 0$, find $\alpha^3 + \beta^3 / \alpha^4 + \beta^4 / \dots$

- ① Prog 4, λ 2, -7, 9
 - ② 出 h, k (無視佢)
 - ③ 出 α, β , 自動 STO λ X, Y
 - ④ λ $X^3 + Y^3$
- Ans = $-\frac{35}{8}$

$$\begin{aligned} * \alpha + \beta &= \frac{-b}{a} \\ \alpha\beta &= \frac{c}{a} \\ * \alpha^2 + \beta^2 &= (\alpha + \beta)^2 - 2\alpha\beta \end{aligned}$$

⑤ ⑥ ⑦ ——— (1) find x

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x = \frac{A \pm B \sqrt{C}}{D}$$

5 6 7

E.g. $2x^2 - 7x + 9 = 0$

- ① Prog 4 λ 2, -7, 9
- ② 出 ①, ②, ③, ④ (無視佢)
- ③ 出 A ($\frac{7}{4}$), B ($\frac{1}{4}i$), C (23)

$$\begin{aligned} \text{Ans} &= \frac{7}{4} + \frac{1}{4}i (\sqrt{23}) \\ &= \frac{7 \pm \sqrt{-23}}{4} \end{aligned}$$

* 記得寫 $\sqrt{\quad}$

⑤ ⑥ ⑦ ——— (2)

將數字化成最簡 surd form 簡化 $\sqrt{\quad}$

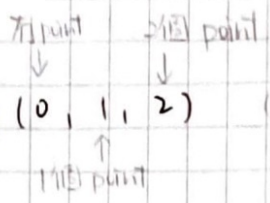
E.g. $\sqrt{162}$

$$\begin{aligned} x &= \sqrt{162} \\ x^2 &= 162 \\ x^2 - 162 &= 0 \quad \text{prog 4 } \lambda 1, 0, 162 \end{aligned}$$

- ① 用 prog 4,
 - ② λ 1, 0, -162
 - ③ 出 0, 9, 2
- $\therefore \text{Ans} = +9\sqrt{2}$

Linear Dreams Come True - (131 bytes)

直線



- ① find equation
- ② 搵 point

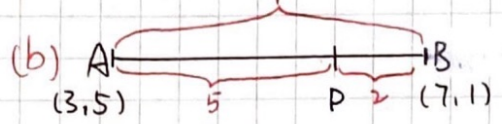
E.g. Let $A=(3,5)$, $B=(7,1)$

- (a) Find equation pass through A, B
- (b) Let P be a point on the straight line $AB=PB=7:2$. Find P.

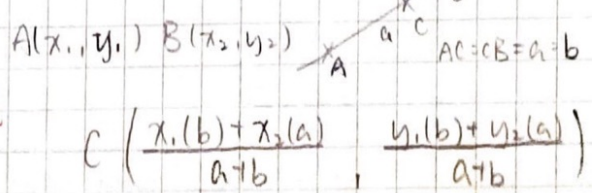
(a) ① $\frac{y-5}{x-3} = \frac{5-1}{3-7}$ 列式 $\frac{y-y_1}{x-x_1} = \frac{y_2-y_1}{x_2-x_1}$ 兩點 \Rightarrow eq.
 slope = slope

- ② $D \wedge 2$ (表示 DCT2)
- ③ $\lambda 2$ 點 $(3, 5, 7, 1)$
- ④ 按 1
- ⑤ $y = mx + c$ 出 m, c

Ans = $y = -x + 8$



$AB=PB=7:2$ *睇清楚題目



① $P\left(\frac{3(2)+7(5)}{5+2}, \frac{5(2)+1(5)}{5+2}\right)$ 列式

- ② $D \wedge 2$
- ③ $\lambda 2$ 點
- ④ $M=1, \lambda M$
- ⑤ 出 equation (m, c)

將比例轉成 $\frac{a}{M} = 1$

兩點 + 比例 \Rightarrow 新點

Ans = $P\left(\frac{41}{7}, \frac{15}{7}\right)$

LDCT (1)

find equation

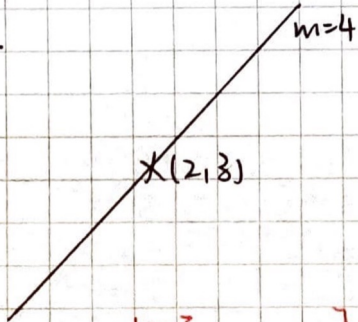
一點 + slope \Rightarrow eq.

① D \wedge I

② \wedge 1 點 + m (slope)

③ 出 m, c

Eg.



$$\frac{y-3}{x-2} = 4 \quad \text{] 列式}$$

$$y = 4x - 5 \quad \text{用 prog. 2}$$

LOCT(10)

直線方程 \Rightarrow Slope

x-intercept

y-intercept

垂直 eq.

平行 eq.

$$Ax + By + C = 0$$

$$\Rightarrow y = m x + c$$

\uparrow
y-intercept

\uparrow
x-intercept

$$\Rightarrow Ax + By + C = 0 \text{ (垂直)} \perp$$

$$\Rightarrow Ax + By + C = 0 \text{ (平行)} =$$

E.g. $L = -4x + 3y - 5 = 0$, $P = (9, 7)$

$$\Rightarrow y = mx + c$$

① $D \wedge 0$

② $\wedge A, B, C (-4, 3, -5)$

③ 出 $m, c (\frac{4}{3}, \frac{5}{3})$

$$\text{Ans} = y = \frac{4}{3}x + \frac{5}{3}$$

$$\Rightarrow \underline{x\text{-intercept}}$$

$$\Rightarrow Ax + By + C = 0 \text{ (垂直)}$$

① \wedge 點 $(9, 7)$

② 出 $A, B, C (3, 4, -55)$

$$\text{Ans} = 3x + 4y - 55 = 0$$

$$\Rightarrow Ax + By + C = 0 \text{ (平行)}$$

① 出 $A, B, C (-4, 3, 15)$

$$\text{Ans} = -4x + 3y + 15 = 0$$

轉正

$$\Rightarrow 4x - 3y - 15 = 0$$

① $m \left(\frac{-A}{B} \right)$

② y-intercept $\left(\frac{-C}{B} \right)$

③ x-intercept $\left(\frac{-C}{A} \right)$

} Program 會寫

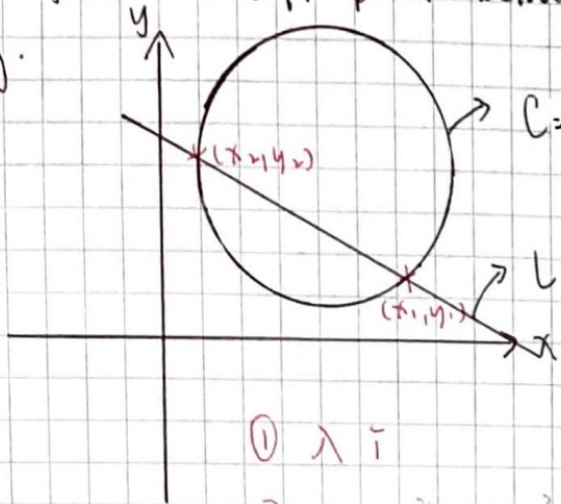
圖形

DCT (i, e, π) (329 bytes)

DCT (i) 圖形 eq + 直線 eq ⇒ 相交點

find intercept point between circle & straight line

Eg.



$$C = \frac{A}{1} x^2 + \frac{B}{1} y^2 + \frac{C}{-1} x + \frac{D}{-3} y + \frac{E}{0} = 0$$

$$L = \frac{a}{2} x + \frac{b}{3} y + \frac{c}{-1} = 0$$

- ① λ i
- ② λ a², b³, c⁻¹
- ③ λ A¹, 0, B¹, C⁻¹, D⁻³, E⁰
- ④ 出兩點 (x₁, y₁) (x₂, y₂)
- ⑤ 出三個數字 X¹², Y¹², Z¹²
(for long 步驟)

LQ 答題:

$$Ax^2 + By^2 + Cx + Dy + E = 0 \quad (1)$$

$$ax + by + c = 0$$

$$y = \frac{-c - ax}{b} \quad (2)$$

Sub (2) into (1),
(照抄)

由下做上去 ↑

$$\underline{X} x^2 + \underline{Y} x + \underline{Z} = 0 \quad (\text{from } (5))$$

$$x = \underline{x_1} \text{ or } \underline{x_2} \quad (\text{from } (4))$$

Sub x = x₁ in (2)

∴ Ans = (x₁, y₁) and (x₂, y₂)

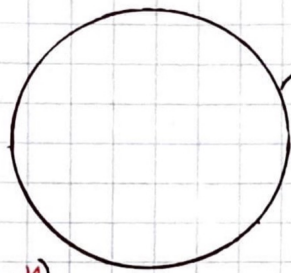
DCT (e)

external point 外點

圓形 eq \Rightarrow Centre, radius

+ 一點 \Rightarrow tangent eq

- ① Find centre of circle
- ② Find radius of circle
- ③ Find tangent equations



$$x^2 + y^2 + \frac{D}{4}x + \frac{E}{-6}y + \frac{F}{-156} = 0$$

* x^2, y^2 的 coefficient 只能是 1

+ P(x, y)

① λ $\frac{D}{4}$, $\frac{E}{-6}$, $\frac{F}{-156}$

② 出 centre $(\frac{-2}{-1}, \frac{3}{-9})$, radius 13

③ λ $\frac{3}{x}$, $\frac{-9}{y}$

④ 出 四個數字, 即兩條 tangent eq.

1) $y = \frac{5}{12}x + \frac{-41}{4}$

2) $y = \frac{5}{12}x + \frac{-41}{4}$

兩條 eq. 一樣,

即 P 係圓上的一點

三角形面積 (63 bytes)

Q: A(0, -3), B(4, 6), C(7, -5)
find area of $\triangle ABC$

$$A = \text{Area of } \triangle ABC = \frac{1}{2} \begin{vmatrix} 1 & 0 & -3 \\ 1 & 4 & 6 \\ 1 & 7 & -5 \end{vmatrix} \\ = \frac{71}{2} \quad * \text{記得} \div 2$$

① 入 1, 0, -3, 1, 4, 6, 1, 7, -5

② 出 71

(如果訂出負數, 將正變成正)

即 $- \rightarrow +$

$+ \rightarrow -$

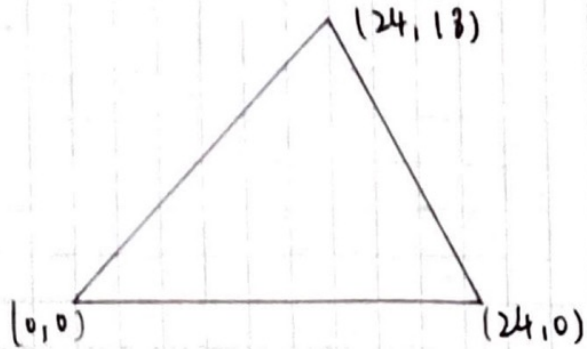
* 記得除 2

Program 4



DCT (1)

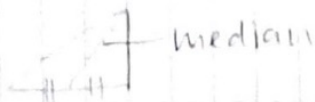
三點找 4 個 + 圓 eq. (140 bytes)



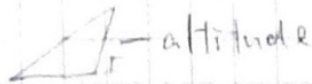
① \wedge $0+0i$, $24+18i$, $24+0i$ * 記得 y-coordinate $+18i$

② 出 Coordinates of 4 個

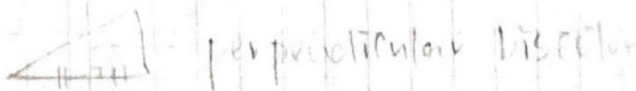
1) Centroid $\frac{16}{x}$ $\frac{6i}{y}$ → 找 SHEET EXE
 median 相交



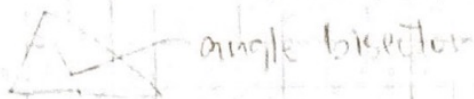
2) Orthocentre $\frac{24}{x}$ $\frac{0i}{y}$
 altitude 相交



3) Circumcenter $\frac{12}{x}$ $\frac{9i}{y}$
 perpendicular bisector 相交



4) Incentre $\frac{18}{x}$ $\frac{6i}{y}$
 angle bisector 相交



③ 出 三個數 (連接三點的圓形 eq.)

$(-24, 18, 0)$

$$Eq = x^2 + y^2 + \underline{-24}x + \underline{18}y + \underline{0} = 0$$

