平面図形を描く

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概 要

kpic.sty を使うように書き直した schlfigure.sty 1.06 を使って、平面図形を描く方法をまとめている。空間図形や、その回転、またパラメータを使って空間曲線を描くこともできる。例を挙げているので参考にして欲しい。

1 平面図形の書き方

kpic.sty を推奨するのは、点を指定して、その点をもとに図形を作成できること、縮尺を考えずに図形を指定でき縮尺は後で自由にできること、交点などを自動で計算するため図形を一部変更しても全体を直さなくても良いことである。
この結果、点の位置を計算しながら図形を作っていた今までと比べて、格段に速く図形を描けるようになった。
この目的のために、いくつかのコマンドを schlmath.sty において拡張している。
空間図形は、¥Snode を用いて空間の点を定義し、¥EKView を使って見やすいように回転させる。これを x 軸から原点を見る視点で平面に落とし表示する。

— 最近の更新 —

2007.11.24	`\SPnode`	空間極座標
2007.11.30	`\PDraw`	パラメータによる平面曲線の描画 (定義は schlgraph2.sty)
2007.11.30	`\PSDraw`	パラメータによる空間曲線の描画 (定義は schlgraph2.sty)
2007.12.01	`\FDrawP`	極座標による平面曲線の描画 (定義は schlgraph2.sty)

基本コマンドと拡張したコマンドの概略を述べる。

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1.1 kpic.sty 1.98.5 の概略

細かいことは、kpic.sty のマニュアルを参照のこと。
\Knode xy 座標による点の指定
\Pnode 極座標による点の指定
\Inode 内分点の指定
\Enode 外分点の指定
\TwoCirclesRight, \TwoCirclesLeft ２円の交点を指定する
\Perpendicularfoot 点から下ろした直線への垂線の足を指定する
\Intersection 二直線の交点を指定する
\Barycenter 三角形の重心
\Circumcenter 三角形の外心
\Incenter 三角形の内心
\Kput
\KPen
\KPath
折れ線をコンマで区切って複数指定できる。
\KLine
\KVec
\KAngle
角をコンマで区切って複数指定できるように、schlfigure.sty で再定義した。

1.2 schlfigure における kpic.sty の拡張

1.2.1 表示系

\EKCircleLineNear[*]{AB}(C,d){P}[\KSame][t]
直線 AB と中心 C 直径 d の円の交点のうち A に近い方を P とする

1.2.2 計算系

`\EKPoint{A}{\tmpA}`
点 A の座標が `\tmpA` に入る。形式は (1.2,3.5)

`\EKDistance{AB}{\tmpA}`
線分 AB の長さが `\tmpA` に入る。

`\EKParagram{ABC}(\tmpA,\tmpB)`
平行四辺形 ABCD の頂点 D の座標が `\tmpA`, `\tmpB` に入る。

`\EKLParagram{ABC}{3}(\tmpA,\tmpB)`
$\overrightarrow{\mathrm{AB}}$と$\overrightarrow{\mathrm{DC}}$が同じ向きで、CD=3 である点 D の座標が`\tmpA`, `\tmpB` に入る。

`\EKPerpgram{ABC}(\tmpA,\tmpB)`
$\overrightarrow{\mathrm{AB}}\perp\overrightarrow{\mathrm{CD}}$となる点 D の座標が `\tmpA`, `\tmpB` に入る。

`\EKLPerpgram{ABC}{3}(\tmpA,\tmpB)`
$\overrightarrow{\mathrm{AB}}\perp\overrightarrow{\mathrm{CD}}$かつ CD=3 となる点 D の座標が `\tmpA`, `\tmpB` に入る。

`\SolvSimEq(a,b,c)(d,e,f)(\tmpA,\tmpB)`
$ax+by=c$, $dx+ey=f$ を解いて $(x,y)=$(`\tmpA`, `\tmpB`) を返す。

`\GetEqLine{AB}(\tmpA,\tmpB,\tmpC)`
直線 AB の方程式 $ax+by+c=0$ の係数 $(a,b,c)=$(`\tmpA`, `\tmpB`, `\tmpC`) を返す。

`\EKPolerSystem(\tmpA,\tmpB)(r,`θ`)`
直交座標 (`\tmpA`,`\tmpB`) の点の極座標 (`r`,θ) を返す。

1.3 今後の予定

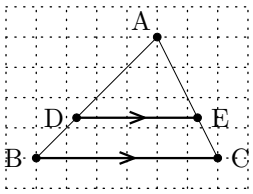
- ベクトルの線形結合で、点を指定する
- 座標を開いたり、閉じたりする
- PIC で図形の回り込み制御を行っているが、kpic の拡張として定義し直す。
- view を拡張し、x 軸回転もサポートする。

2 具体例

東京書籍　数学 A 第 3 章　平面図形　にある図を実際に作図してみたものである。

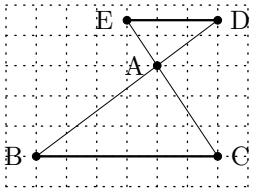
2.1 三角形と比

2.1.1 三角形と比１



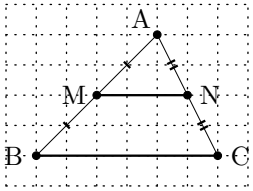

```
\unitlength=5mm
\begin{PicDot}(8,7)(-1,-1)%
\Knode*(0,0){B}[\KSame][l]
\Knode*(6,0){C}[\KSame][r]
\Knode*(4,5){A}[\KSame][lt]
\Inode*{AB}(2:1){D}[\KSame][l]
\Inode*{AC}(2:1){E}[\KSame][r]
\KPath{ABCA}
\thicklines
\EKParallel[1]{DE,BC}
\KPath{DE,BC}
\end{PicDot}%
```

2.1.2 三角形と比２



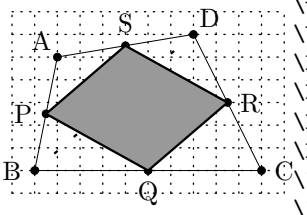

```
\unitlength=4mm%
\begin{PicDot}(8,10)(-1,-1)%
\Knode*(0,0){B}[\KSame][l]
\Knode*(6,0){C}[\KSame][r]
\Knode*(4,5){A}[\KSame][l]
\Enode*{AB}(1:3){D}[\KSame][r]
\Enode*{AC}(1:3){E}[\KSame][l]
\KPath{DBCE}
\thicklines
\KPath{DE,BC}
\end{PicDot}%
```

2.1.3 中点連結定理



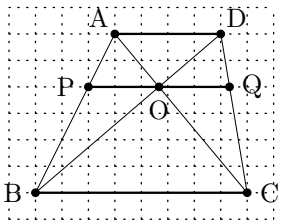

```
\unitlength=5mm%
\begin{PicDot}(8,7)(-1,-1)%
\Knode*(0,0){B}[\KSame][l]
\Knode*(6,0){C}[\KSame][r]
\Knode*(4,5){A}[\KSame][lt]
\Inode*{AB}(1:1){M}[\KSame][l]
\Inode*{AC}(1:1){N}[\KSame][r]
\KPath{ABCA}
\thicklines
\KPath{MN,BC}
\EKSameLength[1]{AM,MB}
\EKSameLength[2]{AN,NC}
\end{PicDot}%
```

2.1.4 問１



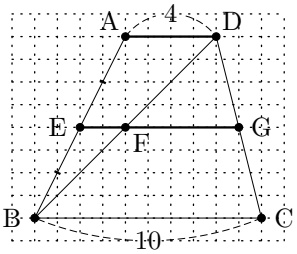

```
\unitlength=5mm%
\begin{PicDot}(12,8)(-1,-1)%
\Knode*(0,0){B}[\KSame][l]
\Knode*(10,0){C}[\KSame][r]
\Knode*(1,5){A}[\KSame][lt]
\Knode*(7,6){D}[\KSame][rt]
\Inode*{AB}(1:1){P}[\KSame][l]
\Inode*{BC}(1:1){Q}[\KSame][b]
\Inode*{CD}(1:1){R}[\KSame][r]
\Inode*{DA}(1:1){S}[\KSame][t]
\KPath{ABCDA}
\thicklines
\KPen{\dashline{0.3}}
\KPath{DB}
\KPen{\solidpath{0.4}}
\KPath{PQRSP}
\end{PicDot}%
```

2.1.5 例題１



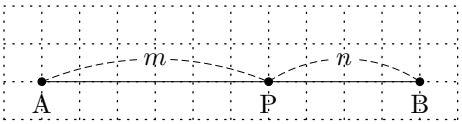

```
\unitlength=5mm%
\begin{PicDot}(9,8)(-1,-1)%
\Knode*(0,0){B}[\KSame][l]
\Knode*(7,0){C}[\KSame][r]
\Knode*(3,6){A}[\KSame][lt]
\Knode*(6,6){D}[\KSame][rt]
\Intersection*{AC}{BD}{o}[O][b]
\EKDistance{oD}{\tmpA}
\EKDistance{oB}{\tmpB}
\Inode*{AB}(\tmpA:\tmpB){P}[\KSame][l]
\Inode*{DC}(\tmpA:\tmpB){Q}[\KSame][r]
\KPath{ABDCA}
\thicklines
\KPath{AD,PQ,BC}
\end{PicDot}%
```

2.1.6 問2

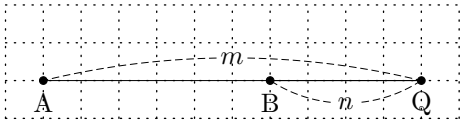



```
\unitlength=3mm%
\begin{PicDot}(12,10)(-1,-1)%
\Knode*(0,0){B}[\KSame][l]
\Knode*(10,0){C}[\KSame][r]
\Knode*(4,8){A}[\KSame][lt]
\Knode*(8,8){D}[\KSame][rt]
\Inode*{AB}(1:1){E}[\KSame][l]
\Inode*{CD}(1:1){G}[\KSame][r]
\Inode*{BD}(1:1){F}[\KSame][rb]
\KPath{ABDC}
\KLineDashArc{BC}[10][b]
\KLineDashArc{AD}[4][t]
\EKSameLength[1]{AE,EB}
\thicklines
\KPath{AD,EG}
\end{PicDot}%
```

2.1.7 内分と外分

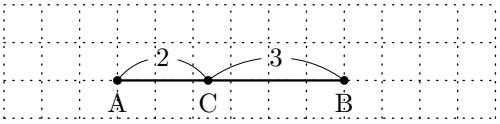



```
\unitlength=5mm%
\begin{PicDot}(12,3)(-1,-1)%
\Knode*(0,0){A}[\KSame][b]
\Knode*(10,0){B}[\KSame][b]
\Inode*{AB}(3:2){P}[\KSame][b]
\KLineDashArc{AP}[$m$][t]
\KLineDashArc{PB}[$n$][t]
\end{PicDot}%
```

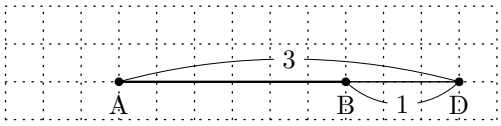



```
\unitlength=5mm%
\begin{PicDot}(12,3)(-1,-1)%
\Knode*(0,0){A}[\KSame][b]
\Knode*(6,0){B}[\KSame][b]
\Enode*{AB}(5:2){Q}[\KSame][b]
\KLineDashArc{AQ}[$m$][t]
\KLineDashArc{QB}[$n$][b]
\end{PicDot}%
```

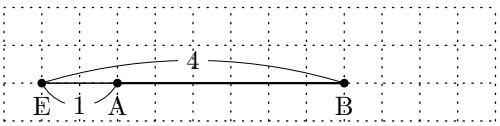
2.1.8 例1




```
\unitlength=5mm%
\begin{PicDot}(13,3)(-3,-1)%
\Knode*(0,0){A}[\KSame][b]
\Knode*(6,0){B}[\KSame][b]
\Inode*{AB}(2:3){C}[\KSame][b]
\KLineArc{AC}[2][t]
\KLineArc{CB}[3][t]
\thicklines
\KPath{AB}
\end{PicDot}%
```



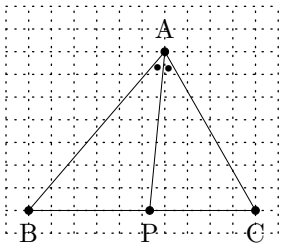

```
\unitlength=5mm%
\begin{PicDot}(13,3)(-3,-1)%
\Knode*(0,0){A}[\KSame][b]
\Knode*(6,0){B}[\KSame][b]
\Enode*{AB}(3:1){D}[\KSame][b]
\KLineArc{AD}[3][t]
\KLineArc{DB}[1][b]
\thicklines
\KPath{AB}
\end{PicDot}%
```




```
\unitlength=5mm%
\begin{PicDot}(13,3)(-3,-1)%
\Knode*(0,0){A}[\KSame][b]
\Knode*(6,0){B}[\KSame][b]
\Enode*{AB}(1:4){E}[\KSame][b]
\KLineArc{AE}[1][b]
\KLineArc{EB}[4][t]
\thicklines
\KPath{AB}
\end{PicDot}%
```

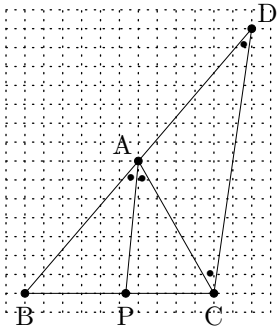
2.2 三角形の内角と外角の二等分線

2.2.1 内角の二等分線と比 (定理)



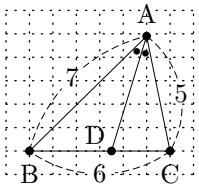

```
\unitlength=4mm%
\begin{PicDot}(12,10)(-1,-1)%
\Knode*(0,0){B}[\KSame][b]
\Knode*(10,0){C}[\KSame][b]
\Knode*(6,7){A}[\KSame][t]
\Incenter{ABC}{a}%[\KSame][t]
% ↑内心を使って角の二等分線を表す
\Intersection*{Aa}{BC}{P}[\KSame][b]
\KPath{ABCA,AP}
\EKAngle{BAP,PAC}{\bf ・}
\end{PicDot}%
```

2.2.2 内角の二等分線と比 (証明)



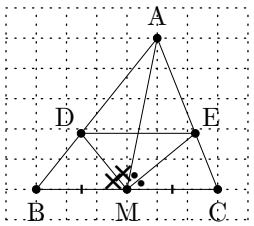

```
\unitlength=4mm%
\begin{PicDot}(14,16)(-1,-1)%
\Knode*(0,0){B}[\KSame][b]
\Knode*(10,0){C}[\KSame][b]
\Knode*(6,7){A}[\KSame][tl]
\Incenter{ABC}{a}%[\KSame][t]
\Intersection*{Aa}{BC}{P}[\KSame][b]
\Enode*{AB}(1:2){D}[\KSame][tr]
\KPath{ABCA,AP,ADC}
\EKAngle[1]{BAP,PAC,DCA,ADC}{\bf ・}
\end{PicDot}%
```

2.2.3 問4



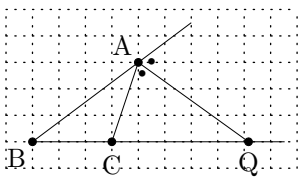

```
\unitlength=6mm%
\begin{PicDot}(8,7)(-1,-1)%
\Knode*(0,0){B}[\KSame][b]
\Knode*(6,0){C}[\KSame][b]
\TwoCirclesLeft*{BC}(7,5){A}[\KSame][t]
\Incenter{ABC}{a}%[\KSame][t] <- 内心を使って角の二等分線を表す
\Intersection*{Aa}{BC}{D}[\KSame][lt]
\EKAngle{BAD,DAC}{\bf ・}
\KPath{AD}
\KLineDashArc{BC}[6][b]
\KLineDashArc{CA}[5][r]
\KLineDashArc{AB}[7][tl]
\end{PicDot}%
```

2.2.4 問5



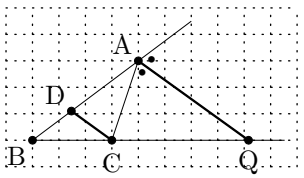

```
\unitlength=6mm%
\begin{PicDot}(8,7)(-1,-1)%
\Knode*(0,0){B}[\KSame][b]
\Knode*(6,0){C}[\KSame][b]
\Knode*(4,5){A}[\KSame][t]
\Inode*{BC}(1:1){M}[\KSame][b]
\Incenter{ABM}{a}%[\KSame][t]
\Incenter{AMC}{b}%[\KSame][t]
\Intersection*{Ma}{AB}{D}[\KSame][lt]
\Intersection*{Mb}{AC}{E}[\KSame][rt]
\KPath{ABCA,AM,DEMD}
\EKSameLength[1]{BM,MC}
\EKAngle[0.5]{CME,EMA}{\bf ・}
\EKAngle[0.5]{AMD,DMB}{\bf ×}
\end{PicDot}%
```

2.2.5 外角の二等分線と比 (定理)



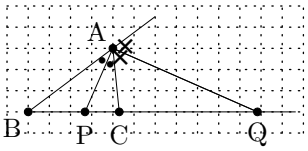

```
\unitlength=5mm
\begin{PicDot}(11,6)(-1,-1)
\Knode*(0,0){B}[\KSame][lb]
\Knode*(4,3){A}[\KSame][lt]
\Enode{AB}(1:3){a}
\Knode*(3,0){C}[\KSame][b]
\Incenter{aAC}{b}%[\KSame][t]
\Intersection*{Ab}{BC}{Q}[\KSame][b]
\Enode{QB}(1:7){c}
\KPath{aBc,CAQ}
\EKAngle[0.5]{CAQ,QAa}{\bf ・}
\end{PicDot}
```

2.2.6 問6




```
\unitlength=5mm
\begin{PicDot}(11,6)(-1,-1)
\Knode*(0,0){B}[\KSame][lb]
\Knode*(4,3){A}[\KSame][lt]
\Enode{AB}(1:3){a}
\Knode*(3,0){C}[\KSame][b]
\Incenter{aAC}{b}%[\KSame][t]
\Intersection*{Ab}{BC}{Q}[\KSame][b]
\Enode{QB}(1:7){c}
\KPath{aBc,CAQ}
\EKAngle[0.5]{CAQ,QAa}{\bf ・}
\EKParagram{QAC}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){d}%[\KSame][t]
\Intersection*{AB}{Cd}{D}[\KSame][lt]
\thicklines
\KPath{AQ,CD}
\end{PicDot}
```

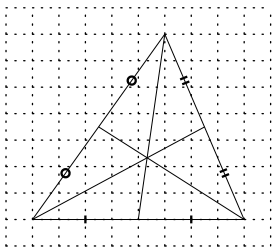
2.2.7 角の二等分線と比の定理の逆 (定理)




```
\unitlength=5mm
\begin{PicDot}(14,6)(-1,-1)
\Knode*(0,0){B}[\KSame][lb]
\Knode*(4,3){A}[\KSame][lt]
\Enode{AB}(1:3){a}
\Knode*(4.3,0){C}[\KSame][b]
\Incenter{aAC}{b}%[\KSame][t]
\Intersection*{Ab}{BC}{Q}[\KSame][b]
\Enode{QB}(1:7){c}
\KPath{aBc,CAQ}
\EKAngle[0.6]{CAQ,QAa}{\bf\small ×}
\Incenter{ABC}{p}%[\KSame][b]
\Intersection*{Ap}{BC}{P}[\KSame][b]
\EKAngle{BAP,PAC}{\bf ・}
\KPath{AQ,AP}
\end{PicDot}
```

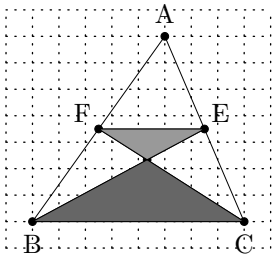
2.3 三角形の重心・外心・内心

2.3.1 三角形の重心 (定理)



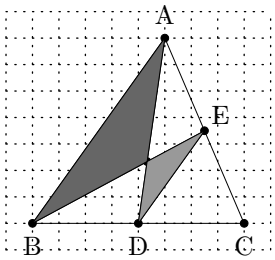
```
\unitlength=5mm
\begin{PicDot}(10,9)(-1,-1)
\Knode(0,0){B}%[\KSame][b]
\Knode(8,0){C}%[\KSame][b]
\Knode(5,7){A}%[\KSame][t]
\Inode{BC}(1:1){L}%[\KSame][b]
\Inode{CA}(1:1){M}%[\KSame][rt]
\Inode{AB}(1:1){N}%[\KSame][lt]
\KPath{ABCA,AL,BM,CN}
\EKSameLength[1]{BL,LC}
\EKSameLength[2]{CM,MA}
\EKSameLength[0]{AN,NB}
\end{PicDot}
```

2.3.2 三角形の重心 (証明) 1



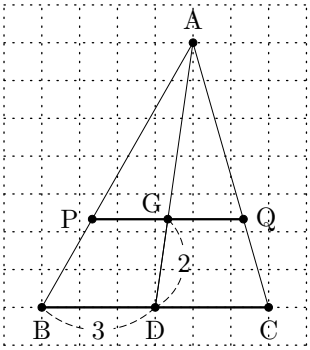

```
\unitlength=5mm
\begin{PicDot}(10,9)(-1,-1)
\Knode*(0,0){B}[\KSame][b]
\Knode*(8,0){C}[\KSame][b]
\Knode*(5,7){A}[\KSame][t]
\Inode{BC}(1:1){L}%[\KSame][b]
\Inode*{CA}(1:1){E}[\KSame][rt]
\Inode*{AB}(1:1){F}[\KSame][lt]
\Intersection*{BE}{CF}{G}[\KSame][b]
\KPath{ABCA,BEFC}
\KPen{\solidpath{0.4}}
\KPath{EFGE}
\KPen{\solidpath{0.6}}
\KPath{BCGB}
\end{PicDot}
```

2.3.3 三角形の重心 (証明) 2



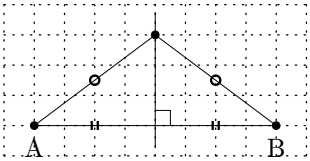

```
\unitlength=5mm
\begin{PicDot}(10,9)(-1,-1)
\Knode*(0,0){B}[\KSame][b]
\Knode*(8,0){C}[\KSame][b]
\Knode*(5,7){A}[\KSame][t]
\Inode*{BC}(1:1){D}[\KSame][b]
\Inode*{CA}(1:1){E}[\KSame][rt]
\Inode{AB}(1:1){F}%[\KSame][lt]
\Intersection*{BE}{AD}{H}[\KSame][lt]
\KPath{ABCA,ADEB}
\KPen{\solidpath{0.4}}
\KPath{DEHD}
\KPen{\solidpath{0.6}}
\KPath{ABHA}
\end{PicDot}
```

2.3.4 問8



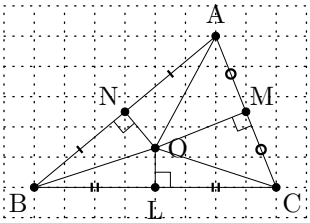

```
\unitlength=5mm
\begin{PicDot}(8,9)(-1,-1)
\Knode*(4,7){A}[\KSame][t]
\Knode*(0,0){B}[\KSame][b]
\Knode*(6,0){C}[\KSame][b]
\Barycenter*{ABC}{G}[\KSame][lt]
\Intersection*{AG}{BC}{D}[\KSame][b]
\KPath{ABCAD}
\EKParagram{BCG}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){q}%[\KSame][t]
\Intersection*{Gq}{AB}{P}[\KSame][l]
\Intersection*{Gq}{AC}{Q}[\KSame][r]
\KLineDashArc{BD}[3][b]
\KLineDashArc{GD}[2][r]
\thicklines
\KPath{PQ,BC}
\end{PicDot}
```

2.3.5 三角形の外心



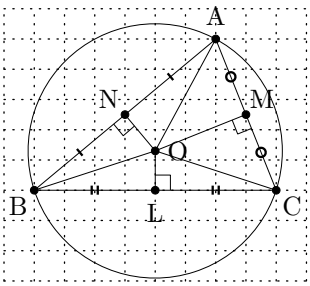

```
\unitlength=5mm
\begin{PicDot}(10,5)(-1,-1)
\Knode*(0,0){A}[\KSame][b]
\Knode*(8,0){B}[\KSame][b]
\Knode*(4,3){c}
\Inode{AB}(1:1){d}
\Enode{cd}(1:5){e}
\Enode{cd}(5:1){f}
\KPath{ef,ABcA}
\KNinty{cdB}
\EKSameLength[2]{Ad,dB}
\EKSameLength[0]{Ac,cB}
\end{PicDot}
```

2.3.6 三角形の外心 (証明)



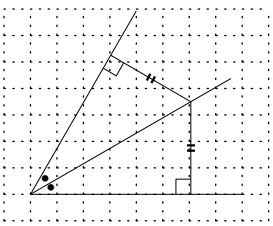

```
\unitlength=5mm
\begin{PicDot}(10,7)(-1,-1)
\Knode*(6,5){A}[\KSame][t]
\Knode*(0,0){B}[\KSame][lb]
\Knode*(8,0){C}[\KSame][rb]
\KPath{ABCA}
\Circumcenter*{ABC}{P}[O][r]
\Perpendicularfoot*{BC}{P}{L}[\KSame][b]
\Perpendicularfoot*{CA}{P}{M}[\KSame][rt]
\Perpendicularfoot*{AB}{P}{N}[\KSame][lt]
\KPath{PA,PB,PC,PL,PM,PN}
\EKNinty{PLC,PMC,PNB}
\EKSameLength[1]{AN,NB}
\EKSameLength[2]{BL,LC}
\EKSameLength[0]{AM,MC}
\end{PicDot}
```

2.3.7 外接円



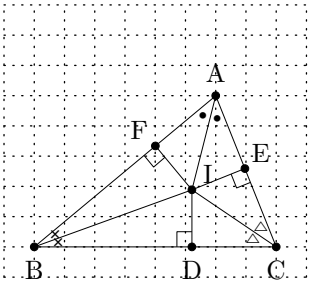

```
\unitlength=5mm
\begin{PicDot}(10,9)(-1,-3)
\Knode*(6,5){A}[\KSame][t]
\Knode*(0,0){B}[\KSame][lb]
\Knode*(8,0){C}[\KSame][rb]
\KPath{ABCA}
\Circumcenter*{ABC}{P}[O][r]% O は特別で、(0,0) 以外に指定できない
\Kput{P}{$\circle{\KDiameter}$}
\Perpendicularfoot*{BC}{P}{L}[\KSame][b]
\Perpendicularfoot*{CA}{P}{M}[\KSame][rt]
\Perpendicularfoot*{AB}{P}{N}[\KSame][lt]
\KPath{PA,PB,PC,PL,PM,PN}
\EKNinty{PLC,PMC,PNB}
\EKSameLength[1]{AN,NB}
\EKSameLength[2]{BL,LC}
\EKSameLength[0]{AM,MC}
\end{PicDot}
```

2.3.8 三角形の内心



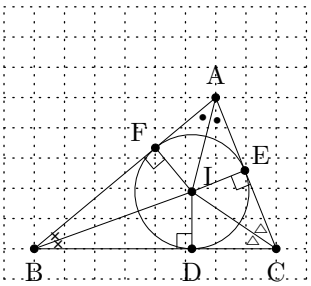
```
\unitlength=5mm
\begin{PicDot}(10,9)(-1,-1)
\Knode(0,0){B}%[\KSame][b]
\Knode(8,0){c}%[\KSame][b]
\Pnode(8,60){a}%[\KSame][lt]
\Pnode(7,30){d}%[\KSame][t]
\Enode{Bd}(5:1){e}%[\KSame][t]
\Perpendicularfoot{Bc}{d}{f}%[\KSame][t]
\Perpendicularfoot{Ba}{d}{g}%[\KSame][t]
\KPath{aBc,Be,gdf}
\EKNinty{dfB,dgB}
\EKAngle{cBe,eBa}{\bf ・}
\EKSameLength[2]{dg,df}
\end{PicDot}
```

2.3.9 三角形の内心 (証明) 1




```
\unitlength=5mm
\begin{PicDot}(10,9)(-1,-1)
\Knode*(6,5){A}[\KSame][t]
\Knode*(0,0){B}[\KSame][b]
\Knode*(8,0){C}[\KSame][b]
\KPath{ABCA}
\Incenter*{ABC}{I}[\KSame][rt]
\Perpendicularfoot*{AB}{I}{F}[\KSame][lt]
\Perpendicularfoot*{BC}{I}{D}[\KSame][b]
\Perpendicularfoot*{CA}{I}{E}[\KSame][rt]
\KPath{AIF,BID,CIE}
\EKNinty{IFB,IDB,IEC}
\EKAngle{EAI,IAF}{\bf ・}
\EKAngle{ABI,IBC}{\bf\tiny ×}
\EKAngle{ICA,BCI}{\bf\tiny$\SANKAKU{}$}
\end{PicDot}
```

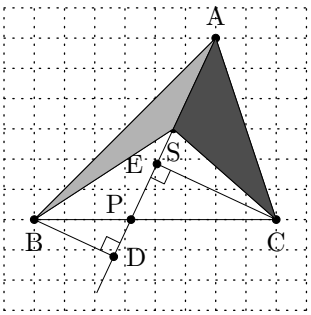
2.3.10 三角形の内心 (証明) 2




```
\unitlength=5mm
\begin{PicDot}(10,9)(-1,-1)
\Knode*(6,5){A}[\KSame][t]
\Knode*(0,0){B}[\KSame][b]
\Knode*(8,0){C}[\KSame][b]
\KPath{ABCA}
\Incenter*{ABC}{I}[\KSame][rt]
\Kput{I}{\circle{\KDiameter}}
\Perpendicularfoot*{AB}{I}{F}[\KSame][lt]
\Perpendicularfoot*{BC}{I}{D}[\KSame][b]
\Perpendicularfoot*{CA}{I}{E}[\KSame][rt]
\KPath{AIF,BID,CIE}
\EKNinty{IFB,IDB,IEC}
\EKAngle{EAI,IAF}{\bf ・}
\EKAngle{ABI,IBC}{\bf\tiny ×}
\EKAngle{ICA,BCI}{\bf\tiny$\SANKAKU{}$}
\end{PicDot}
```

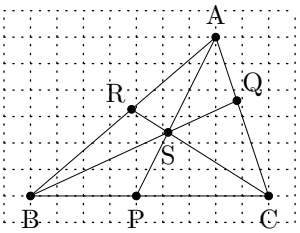
2.4 三角形の比の定理

2.4.1 チェバの定理



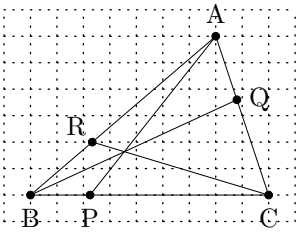

```
\unitlength=5mm
\begin{PicDot}(10,10)(-1,-3)
\Knode*(0,0){B}[\KSame][b]
\Knode*(8,0){C}[\KSame][b]
\Knode*(6,6){A}[\KSame][t]
\KPath{ABCA}
\Inode*{BC}(2:3){P}[\KSame][lt]
\Inode*{AP}(1:1){S}[\KSame][b]
\Perpendicularfoot*{AP}{C}{E}[\KSame][l]
\Perpendicularfoot*{AP}{B}{D}[\KSame][r]
\Enode{AD}(7:1){d}
\KPath{Ad,DBSCE}
\EKNinty{BDA,CEP}
\KPen{\solidpath{0.3}}
\KPath{ABSA}
\KPen{\solidpath{0.7}}
\KPath{ACSA}
\end{PicDot}
```

2.4.2 チェバの定理 (定理)



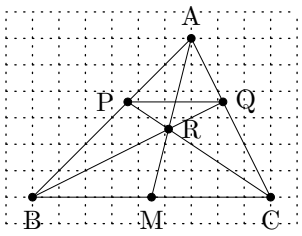

```
\unitlength=5mm
\begin{PicDot}(11,8)(-1,-1)
\Knode*(7,6){A}[\KSame][t]
\Knode*(0,0){B}[\KSame][b]
\Knode*(9,0){C}[\KSame][b]
\KPath{ABCA}
\Inode*{BC}(4:5){P}[\KSame][b]
\Inode*{AP}(3:2){S}[\KSame][b]
\Intersection*{AB}{CS}{R}[\KSame][lt]
\Intersection*{AC}{BS}{Q}[\KSame][rt]
\KPath{AP,BQ,CR}
\end{PicDot}
```

2.4.3 問 10



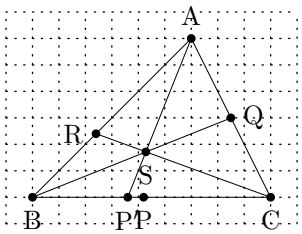

```
\unitlength=5mm
\begin{PicDot}(11,8)(-1,-1)
\Knode*(7,6){A}[\KSame][t]
\Knode*(0,0){B}[\KSame][b]
\Knode*(9,0){C}[\KSame][b]
\KPath{ABCA}
\Inode*{AC}(2:3){Q}[\KSame][r]
\Inode*{AB}(2:1){R}[\KSame][lt]
\Intersection{BQ}{CR}{s}%[\KSame][lt]
\Intersection*{BC}{As}{P}[\KSame][b]
\KPath{AP,BQ,CR}
\end{PicDot}
```

2.4.4 例題２



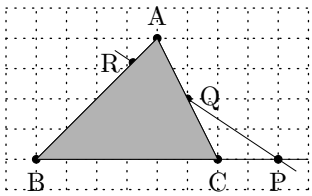

```
\unitlength=5mm
\begin{PicDot}(11,8)(-1,-1)
\Knode*(6,6){A}[\KSame][t]
\Knode*(0,0){B}[\KSame][b]
\Knode*(9,0){C}[\KSame][b]
\KPath{ABCA}
\Inode*{AB}(2:3){P}[\KSame][l]
\EKParagram{BCP}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){q}
\Intersection*{AC}{Pq}{Q}[\KSame][r]
\Intersection*{BQ}{CP}{R}[\KSame][r]
\Intersection*{BC}{AR}{M}[\KSame][b]
\KPath{AM,BQPC}
\end{PicDot}
```

2.4.5 チェバの定理の逆 (証明)



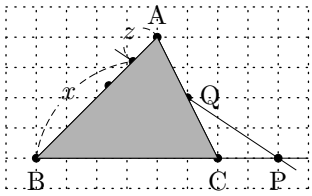

```
\unitlength=5mm
\begin{PicDot}(11,8)(-1,-1)
\Knode*(6,6){A}[\KSame][t]
\Knode*(0,0){B}[\KSame][b]
\Knode*(9,0){C}[\KSame][b]
\KPath{ABCA}
\Inode*{AB}(3:2){R}[\KSame][l]
\Inode*{AC}(1:1){Q}[\KSame][r]
\Intersection*{BQ}{CR}{S}[\KSame][b]
\Intersection*{BC}{AS}{p}[P$'$][b]
\Enode*{Bp}(7:1){P}[\KSame][b]
\KPath{Ap,BQ,CR}
\end{PicDot}
```

2.4.6 メネラウスの定理 (定理)



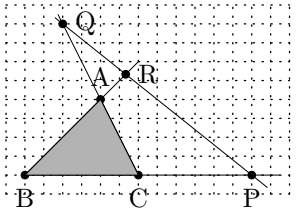

```
\unitlength=5mm
\begin{PicDot}(10,6)(-1,-1)
\Knode*(4,4){A}[\KSame][t]
\Knode*(0,0){B}[\KSame][b]
\Knode*(6,0){C}[\KSame][b]
\Inode*{AB}(1:4){R}[\KSame][l]
\Inode*{AC}(1:1){Q}[\KSame][r]
\Intersection*{BC}{RQ}{P}[\KSame][b]
\Enode{BP}(9:1){p}%[\KSame][b]
\Enode{RP}(9:1){q}%[\KSame][t]
\Enode{PR}(9:1){r}%[\KSame][t]
\KPath{CABp,qr}
\KPen{\solidpath{0.3}}
\KPath{ABCA}
\end{PicDot}
```

2.4.7 メネラウスの定理 (証明) 1



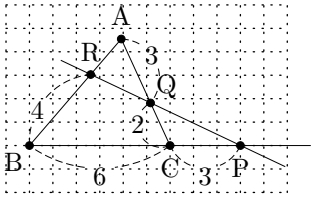

```
\unitlength=5mm
\begin{PicDot}(10,6)(-1,-1)
\Knode*(4,4){A}[\KSame][t]
\Knode*(0,0){B}[\KSame][b]
\Knode*(6,0){C}[\KSame][b]
\Inode*{AB}(1:4){R}[\KSame][r]
\Inode*{AC}(1:1){Q}[\KSame][r]
\Intersection*{BC}{RQ}{P}[\KSame][b]
\Enode{BP}(9:1){p}%[\KSame][b]
\Enode{RP}(9:1){q}%[\KSame][t]
\Enode{PR}(9:1){r}%[\KSame][t]
\KPath{CABp,qr}
\EKParagram{PRC}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){a}
\Intersection*{AB}{Ca}{S}[\KSame][b]
\KPath{CS}
\KLineArcLenS=2mm
\KLineArcLenE=2mm
\KLineNameDashArc{BR}[$x$][lt]
\KLineNameDashArc{SR}[$y$][rb]
\KLineNameDashArc{RA}[$z$][lt]
\KPen{\solidpath{0.3}}
\KPath{ABCA}
\end{PicDot}
```

2.4.8 メネラウスの定理 (証明) 2



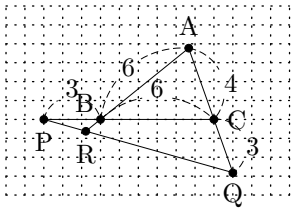

```
\unitlength=5mm
\begin{PicDot}(15,10)(-1,-1)
\Knode*(4,4){A}[\KSame][t]
\Knode*(0,0){B}[\KSame][b]
\Knode*(6,0){C}[\KSame][b]
\Enode*{AB}(1:4){R}[\KSame][r]
\Enode*{AC}(1:2){Q}[\KSame][r]
\Intersection*{BC}{RQ}{P}[\KSame][b]
\Enode{BP}(9:1){p}%[\KSame][b]
\Enode{RQ}(9:1){q}%[\KSame][t]
\Enode{RP}(9:1){r}%[\KSame][t]
\Enode{BR}(9:1){s}%[\KSame][t]
\Enode{AQ}(9:1){t}%[\KSame][t]
\KPath{Ct,Bs,CABp,qr}
\KLineArcLenS=2mm
\KLineArcLenE=2mm
\KPen{\solidpath{0.3}}
\KPath{ABCA}
\end{PicDot}
```

2.4.9 問１４ (1)



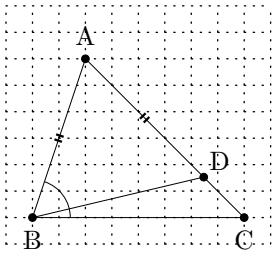

```
\unitlength=5mm
\begin{PicDot}(12,8)(-1,-2)
\Knode*(0,0){B}[\KSame][bl]
\Knode*(6,0){C}[\KSame][b]
\TwoCirclesLeft*{BC}(6,5){A}[\KSame][t]
\Enode*{BC}(9:3){P}[\KSame][b]
\Inode*{AC}(3:2){Q}[\KSame][rt]
\Inode*{AB}(2:4){R}[\KSame][t]
\Enode{RQ}(1:3){r}%[\KSame][t]
\Enode{PQ}(1:3){q}%[\KSame][t]
\Enode{PC}(1:2){p}%[\KSame][t]
\KPath{CABp,qr}
\KLineNameDashArc{RB}[4][l,rb]
\KLineNameDashArc{BC}[6][b,t]
\KLineNameDashArc{CP}[3][b,t]
\KLineNameDashArc{CQ}[2][l,rt]
\KLineNameDashArc{QA}[3][rt,lb]
\end{PicDot}
```

2.4.10 問１４ (2)



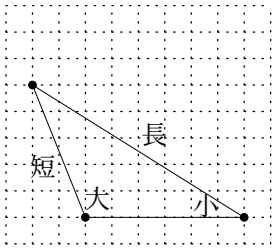

```
\unitlength=5mm
\begin{PicDot}(15,10)(-5,-4)
\Knode*(0,0){B}[\KSame][tl]
\Knode*(6,0){C}[\KSame][r]
\TwoCirclesLeft*{BC}(6,4){A}[\KSame][t]
\Enode*{BC}(3:9){P}[\KSame][b]
\Enode*{AC}(7:3){Q}[\KSame][b]
\Intersection*{AB}{PQ}{R}[\KSame][b]
\KPath{CPQAR}
\KLineNameDashArc{AB}[6][lt,rb]
\KLineNameDashArc{BC}[6][t,b]
\KLineNameDashArc{AC}[4][r,l]
\KLineNameDashArc{CQ}[3][r,l]
\KLineNameDashArc{PB}[3][t,b]
\end{PicDot}
```

2.4.11 辺と角の大小関係



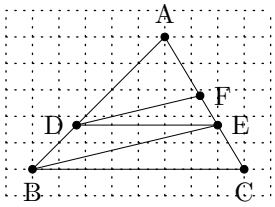

```
\unitlength=5mm
\begin{PicDot}(10,9)(-1,-1)
\Knode*(0,0){B}[\KSame][b]%
\Knode*(8,0){C}[\KSame][b]
\Knode*(2,6){A}[\KSame][t]
\EKDistance{AB}{\tmpA}
\EKLParagram{CAA}{\tmpA}(\tmpB,\tmpC)
\Knode*(\tmpB,\tmpC){D}[\KSame][tr]
\KPath{DBCAB}
\EKSameLength[2]{AD,AB}
\KAngle{CBA}
\end{PicDot}
```

2.4.12 辺と角の大小関係 (定理)



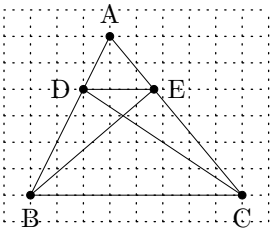

```
\unitlength=5mm
\begin{PicDot}(10,9)(-1,-1)
\Knode*(2,0){B}
\Knode*(8,0){C}
\Knode*(0,5){A}
\KPath{BCAB}
\EKAngle{ABC}{\makebox(0,0){大}}
\EKAngle[1.5]{BCA}{\makebox(0,0){小}}
\KLineName{CA}[\makebox(0,0){
長}][rt]
\KLineName{AB}[\makebox(0,0){
短}][lb]
\end{PicDot}
```

2.4.13 １



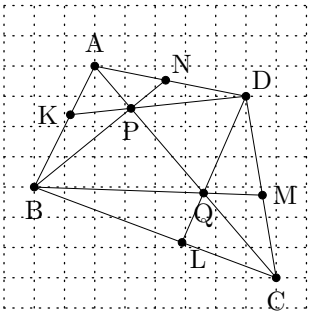

```
\unitlength=5mm
\begin{PicDot}(10,8)(-1,-1)
\Knode*(0,0){B}[\KSame][b]
\Knode*(8,0){C}[\KSame][b]
\Knode*(5,6){A}[\KSame][t]
\Inode*{AB}(3:1.5){D}[\KSame][l]
\EKParagram{CBD}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){e}
\Intersection*{AC}{De}{E}[\KSame][r]
\EKParagram{EBD}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){f}
\Intersection*{AC}{Df}{F}[\KSame][r]
\KPath{ABCA,BEDF}
\end{PicDot}
```

2.4.14 2



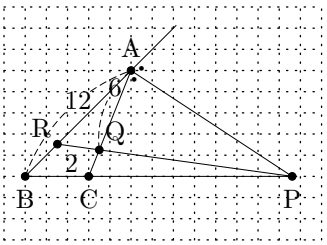

```
\unitlength=5mm
\begin{PicDot}(10,8)(-1,-1)
\Knode*(0,0){B}[\KSame][b]
\Knode*(8,0){C}[\KSame][b]
\Knode*(3,6){A}[\KSame][t]
\Inode*{AB}(1:2){D}[\KSame][l]
\EKParagram{CBD}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){e}
\Intersection*{AC}{De}{E}[\KSame][r]
\KPath{ABCA,BEDC}
\end{PicDot}
```

2.4.15 4




```
\unitlength=5mm
\begin{PicDot}(10,10)(-1,-1)
\Knode*(0,3){B}[\KSame][b]
\Knode*(8,0){C}[\KSame][b]
\Knode*(2,7){A}[\KSame][t]
\Knode*(7,6){D}[\KSame][rt]
\KPath{ABCDAC}
\Inode*{AC}(1:4){P}[\KSame][b]
\Inode*{AC}(3:2){Q}[\KSame][b]
\EKParagram{PDD}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){k}
\Intersection*{Dk}{AB}{K}[\KSame][l]
\EKParagram{PBB}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){n}
\Intersection*{Bn}{AD}{N}[\KSame][tr]
\EKParagram{QBB}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){m}
\Intersection*{Bm}{CD}{M}[\KSame][r]
\EKParagram{QDD}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){l}
\Intersection*{BC}{Dl}{L}[\KSame][rb]
\KPath{BN,DK,DL,BM}
\end{PicDot}
```

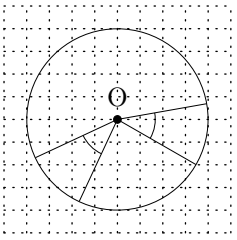
2.4.16 5




```
\unitlength=5mm
\begin{PicDot}(16,10)(-1,-1)
\Knode*(0,0){B}[\KSame][b]
\Knode*(3,0){C}[\KSame][b]
\Knode*(5,5){A}[\KSame][t]
\Enode{AB}(1.5:5){b}%[\KSame][rt]
\Incenter{bAC}{c}%[\KSame][t]
\Intersection*{Ac}{BC}{P}[\KSame][b]
\Inode*{AC}(3:1){Q}[\KSame][rt]
\Intersection*{AB}{PQ}{R}[\KSame][lt]
\KPath{bBPAC,PR}
\KLineNameDashArc{AB}[12][t,tr]
\KLineNameDashArc{AQ}[6][t,tr]
\KLineName{CQ}[2][l]
\EKAngle[0.5]{bAP,PAC}{・}
\end{PicDot}
```

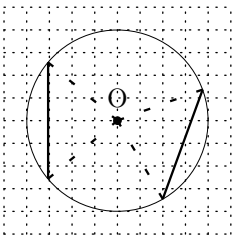
2.5 円周角

2.5.1 円の基本性質１



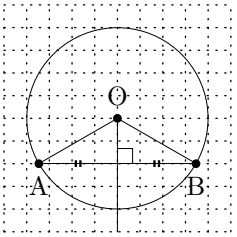

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle{8}}
\Pnode(4,10){A}
\Pnode(4,-30){B}% \Kaku{AOB}=40\DEG
\Pnode(4,205){C}
\Pnode(4,245){D}% \Kaku{COD}=40\DEG
\KPath{AOB,COD}
\KAngle{BOA,COD}
\end{PicDotC}
```

2.5.2 円の基本性質２



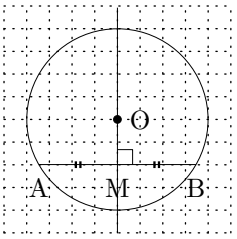

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle{8}}
\Pnode(4,20){A}
\Pnode(4,-60){B}% \Kaku{AOB}=80\DEG
\Pnode(4,140){C}
\Pnode(4,220){D}% \Kaku{COD}=80\DEG
\thicklines
\KPath{AB,CD}
\thicklines
\KPen{\dashline{0.4}}
\KPath{AO,OB,COD}
\end{PicDotC}
```

2.5.3 円の基本性質３



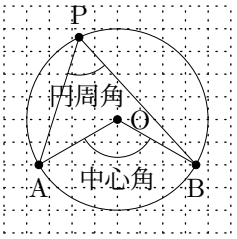

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle{8}}
\Pnode*(4,210){A}[\KSame][b]
\Pnode*(4,-30){B}[\KSame][b]% \Kaku{AOB}=80\DEG
\KPath{OABO}
\Perpendicularfoot{AB}{O}{h}%[\KSame][b]
\Enode{Oh}(2:1.2){p}
\KPath{Op}
\KNinty{OhB}
\EKSameLength[2]{Ah,hB}
\end{PicDotC}
```

2.5.4 円の基本性質４



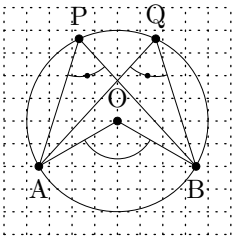

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][r]
\Kput{O}{\circle{8}}
\Pnode(4,210){A}[\KSame][b]
\Pnode(4,-30){B}[\KSame][b]
\KPath{AB}
\Inode{AB}(1:1){M}[\KSame][b]
\EKPerpgram{BAM}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){P}%[\KSame][b]
\Enode{PM}(1:0.3){N}
\KPath{PN}
\KNinty{PMB}
\EKSameLength[2]{AM,MB}
\end{PicDotC}
```

2.5.5 円の基本性質５



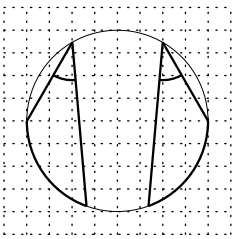

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][r]
\Kput{O}{\circle{8}}
\Pnode*(4,210){A}[\KSame][b]
\Pnode*(4,-30){B}[\KSame][b]%
\Pnode*(4,115){P}[\KSame][t]
\KPath{PAOBP}
\KAngle{AOB}[中心角][b]
\KAngle{APB}[円周角][b]
\end{PicDotC}
```

2.5.6 円周角の定理１



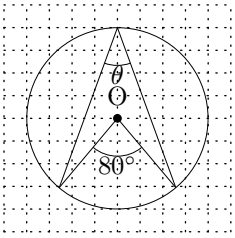

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle{8}}
\Pnode*(4,210){A}[\KSame][b]
\Pnode*(4,-30){B}[\KSame][b]%
\Pnode*(4,115){P}[\KSame][t]
\Pnode*(4,65){Q}[\KSame][t]
\KPath{PAOBP,AQB}
\KAngle{AOB}
\KAngle{APB,AQB}[\circle*{0.2}]
\GetEqLine{AQ}(\tmpA,\tmpB,\tmpC)
\end{PicDotC}
```

2.5.7 円周角の定理２



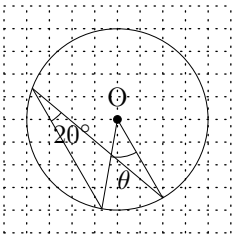
```
\unitlength=4mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}%[\KSame][b]
\Kput{O}{\circle8}
\Pnode(4,-70){P}%[\KSame][b]
\Pnode(4, 60){Q}%[\KSame][b]
\Pnode(4,  0){R}%[\KSame][b]
\Pnode(4,250){S}%[\KSame][b]
\Pnode(4,120){T}%[\KSame][b]
\Pnode(4,180){U}%[\KSame][b]
\thicklines
\KPath{PQR,STU}
\KAngle{PQR,UTS}
\KArc[8]{O}(-70,  0)
\KArc[8]{O}(180,250)
\end{PicDotC}
```

2.5.8 問1 (1)



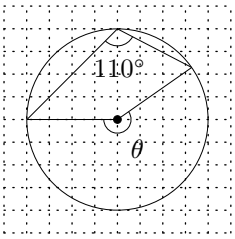

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][t]
\Pnode(4,-50){A}%[\KSame][b]
\Pnode(4,90){B}%[\KSame][b]
\Pnode(4,230){C}%[\KSame][b]
\Kput{O}{\circle8}
\KPath{ABCOA}
\KAngle{CBA}[$\theta$][b]
\KAngle{COA}[80\DEG][b]
\end{PicDotC}
```

2.5.9 問1 (2)



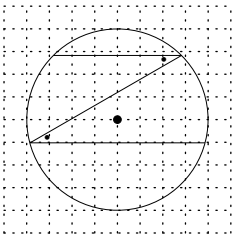

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle8}
\Pnode(4,300){A}%[\KSame][b]
\Pnode(4,260){C}%[\KSame][b]
\Pnode(4,160){B}%[\KSame][b]
\KPath{OABCO}
\KAngle{COA}[$\theta$][b]
\KAngle{CBA}[$20\DEG$][rb]
\end{PicDotC}
```

2.5.10 問1 (3)



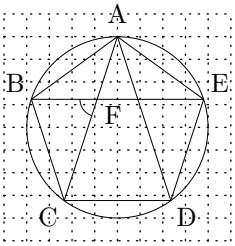

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}%[\KSame][b]
\Kput{O}{\circle8}
\Pnode(4,35){A}%[\KSame][b]
\Pnode(4,90){B}%[\KSame][b]
\Pnode(4,180){C}%[\KSame][b]
\KPath{OABCO}
\KAngle[1.2]{COA}[$\theta$][rb]
\KAngle[1.5]{CBA}[110\DEG][b]
\end{PicDotC}
```

2.5.11 例1



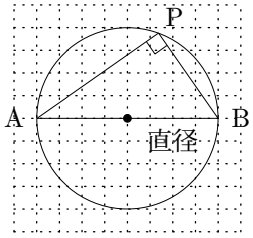
```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}%[\KSame][b]
\Kput{O}{\circle8}
\Pnode(4,135){A}%[\KSame][b]
\Pnode(4, 45){B}%[\KSame][b]
\Pnode(4,195){C}%[\KSame][b]
\Pnode(4,345){D}%[\KSame][b]
\KPath{ABCD}
\EKAngle{ABC,DCB}{・}
\end{PicDotC}
```

2.5.12 問2



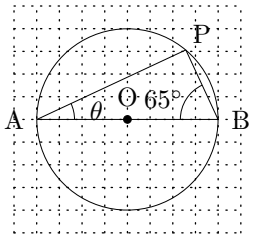

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}%[\KSame][b]
\Kput{O}{\circle8}
\Pnode(4, 90){A}[\KSame][t]
\Pnode(4,162){B}[\KSame][lt]
\Pnode(4,234){C}[\KSame][lb]
\Pnode(4,306){D}[\KSame][rb]
\Pnode(4,378){E}[\KSame][rt]
\KPath{ABCDEA}
\KPath{AC,AD,BE}
\Intersection{AC}{BE}{F}[\KSame][rb]
\KAngle[1.5]{BFC}%[110\DEG][b]
\end{PicDotC}
```

2.5.13 直径と円周角



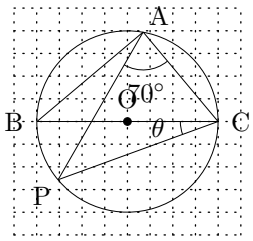

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}%[\KSame][b]
\Kput{O}{\circle8}
\Pnode(4,180){A}[\KSame][l]
\Pnode(4,  0){B}[\KSame][r]
\Pnode(4, 70){P}[\KSame][rt]
\KPath{ABPA}
\KNinty{APB}
\KLineName{OB}[直径][b]
\end{PicDotC}
```

2.5.14 問４ (1)



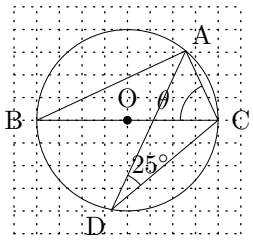

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle8}
\Pnode(4,180){A}[\KSame][l]
\Pnode(4,  0){B}[\KSame][r]
\Pnode(4, 50){P}[\KSame][rt]
\KPath{ABPA}
\KAngle{BAP}[$\theta$][r]
\KAngle{PBA}[$65\DEG$][l]
\end{PicDotC}
```

2.5.15 問４ (2)



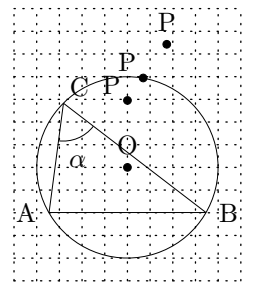

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle8}
\Pnode(4,180){B}[\KSame][l]
\Pnode(4,  0){C}[\KSame][r]
\Pnode(4, 80){A}[\KSame][rt]
\Pnode(4,220){P}[\KSame][lb]
\KPath{ABCAPC}
\KAngle{PAC}[70\DEG][b]
\KAngle{BCP}[$\theta$][l]
\end{PicDotC}
```

2.5.16 問４ (3)



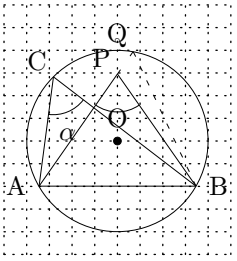

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle8}
\Pnode(4,180){B}[\KSame][l]
\Pnode(4,  0){C}[\KSame][r]
\Pnode(4, 50){A}[\KSame][rt]
\Pnode(4,260){D}[\KSame][lb]
\KPath{ABCADC}
\KAngle{CDA}[25\DEG][rt]
\KAngle{ACB}[$\theta$][l]
\end{PicDotC}
```

2.5.17 円の内部と外部 (図１)



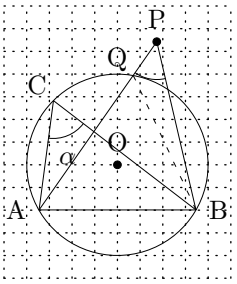

```
\unitlength=5mm
\begin{PicDot}(10,12)(-5,-5)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle8}
\Pnode(4,210){A}[\KSame][l]
\Pnode(4,-30){B}[\KSame][r]
\Pnode(4,135){C}[\KSame][rt]
\Pnode*(4, 80){P}[\KSame][lt]
\KPath{ABCA}
\KAngle{ACB}[$\alpha$][b]
\Inode*{AP}(5:1){Q}[P][lt]
\Enode*{AP}(5:1){R}[P][t]
\end{PicDot}
```

2.5.18 円の内部と外部 (図２)



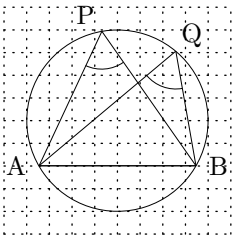

```
\unitlength=5mm
\begin{PicDot}(10,12)(-5,-5)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle8}
\Pnode(4,210){A}[\KSame][l]
\Pnode(4,-30){B}[\KSame][r]
\Pnode(4,135){C}[\KSame][lt]
\Pnode(4, 80){P}[Q][lt]
\Inode{AP}(5:1){Q}[P][lt]
\KPath{ABCA,AQB}
\KPen{\dashline{0.3}}
\KPath{QPB}
\KAngle{ACB}[$\alpha$][b]
\KAngle{AQB}
\end{PicDot}
```

2.5.19 円の内部と外部 (図３)



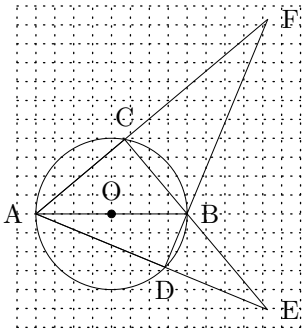

```
\unitlength=5mm
\begin{PicDot}(10,12)(-5,-5)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle8}
\Pnode(4,210){A}[\KSame][l]
\Pnode(4,-30){B}[\KSame][r]
\Pnode(4,135){C}[\KSame][lt]
\Pnode(4, 80){P}[Q][lt]
\Enode*{AP}(5:1){Q}[P][t]
\KPath{ABCA,AQB}
\KPen{\dashline{0.3}}
\KPath{PB}
\KAngle{ACB}[$\alpha$][b]
\KAngle{AQB}
\end{PicDot}
```

2.5.20 円周角の定理の逆



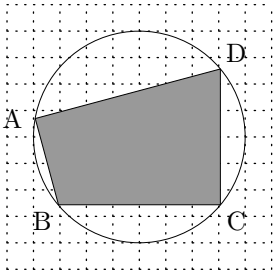

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}%[\KSame][t]
\Kput{O}{\circle8}
\Pnode(4,210){A}[\KSame][l]
\Pnode(4,-30){B}[\KSame][r]
\Pnode(4,100){P}[\KSame][lt]
\Pnode(4, 50){Q}[\KSame][rt]
\KPath{ABPA,ABQA}
\KAngle{APB}%[$\alpha$][b]
\KAngle{AQB}
\end{PicDotC}
```

2.5.21 問６



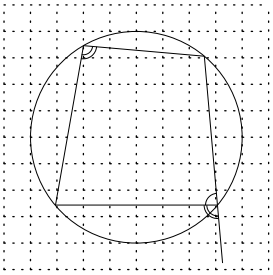

```
\unitlength=3mm
\begin{PicDot}(15,17)(-5,-6)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle8}
\Pnode(4,180){A}[\KSame][l]
\Pnode(4,  0){B}[\KSame][r]
\Pnode(4, 80){C}[\KSame][t]
\Pnode(4,-45){D}[\KSame][b]
\Intersection{AC}{DB}{F}[\KSame][r]
\Intersection{CB}{AD}{E}[\KSame][r]
\KPath{BAFDACEA}
\end{PicDot}
```

2.5.22 円に内接する四角形



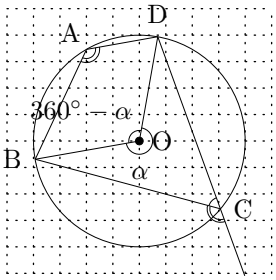

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}%[\KSame][t]
\Kput{O}{\circle8}
\Pnode(4,170){A}[\KSame][l]
\Pnode(4,220){B}[\KSame][lb]
\Pnode(4,320){C}[\KSame][rb]
\Pnode(4, 40){D}[\KSame][rt]
\KPen{\solidpath{0.4}}
\KPath{ABCDA}
\end{PicDotC}
```

2.5.23 円に内接する四角形 (定理)



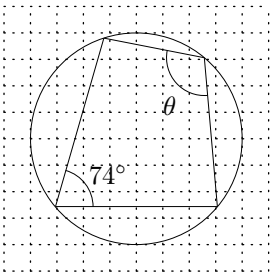
```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}%[\KSame][t]
\Kput{O}{\circle8}
\Pnode(4,120){A}%[\KSame][l]
\Pnode(4,220){B}%[\KSame][lb]
\Pnode(4,320){C}%[\KSame][rb]
\Pnode(4, 50){D}%[\KSame][rt]
\Enode{DC}(5:1.4){E}
\KPath{EDABC}
\KAngle[1]{BAD,BCE}
\KAngle[0.7]{BAD}
\KAngle[0.8]{BCE}
\KAngle[0.9]{DCB}
\end{PicDotC}
```

2.5.24 円に内接する四角形 (証明)



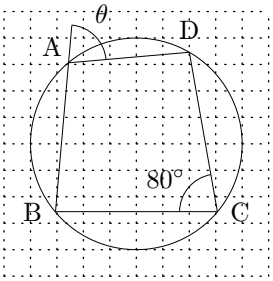

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][r]
\Kput{O}{\circle8}
\Pnode(4,120){A}[\KSame][lt]
\Pnode(4,190){B}[\KSame][l]
\Pnode(4,320){C}[\KSame][r]
\Pnode(4, 80){D}[\KSame][t]
\Enode{DC}(5:1.4){E}
\KPath{EDABC,BOD}
\KAngle[1]{BAD,BCE}
\KAngle[0.7]{BAD}
\KAngle[0.8]{BCE}
\KAngle[0.9]{DCB}
\KAngle[0.8]{DOB}[$360\DEG-\alpha$][t,r]
\KAngle[1]{BOD}[$\alpha$][b,r]
\end{PicDotC}
```

2.5.25 問8 (1)



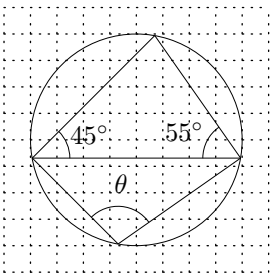

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}%[\KSame][r]
\Kput{O}{\circle8}
\Pnode(4,220){B}%[\KSame][l]
\Pnode(4,320){C}%[\KSame][r]
\Pnode(4, 50){D}%[\KSame][t]
\Pnode{B}(4,74){a}%[\KSame][t]
\EKCircleLineFar{Ba}(0,8){A}%[\KSame][t]
\KPath{CDABC}
\KAngle{CBA}[74\DEG][r,b]
\KAngle{ADC}[$\theta$][b,r]
\end{PicDotC}
```

2.5.26 問8 (2)



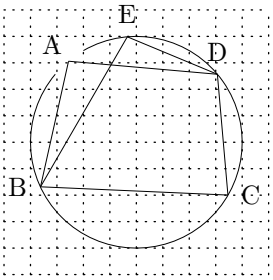

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}%[\KSame][r]
\Kput{O}{\circle8}
\Pnode(4,130){A}[\KSame][lt]
\Pnode(4,220){B}[\KSame][l]
\Pnode(4,320){C}[\KSame][r]
\Pnode{C}(4,100){d}%[\KSame][t]
\EKCircleLineFar{Cd}(0,8){D}[\KSame][t]
\Enode{AB}(1:5){a}
\KPath{aBCDA}
\KAngle{DCB}[80\DEG][l,b]
\KAngle{DAa}[$\theta$][t,l]
\end{PicDotC}
```

2.5.27 問8 (3)



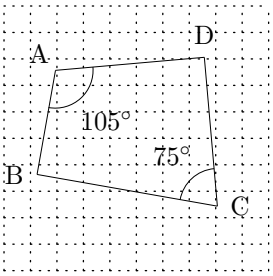

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}%[\KSame][r]
\Pnode(4,190){A}%[\KSame][lt]
\Pnode(4,-10){B}%[\KSame][r]
\Pnode{A}(4,45){a}%[\KSame][t]
\Pnode{B}(4,125){b}%[\KSame][t]
\Intersection{Aa}{Bb}{C}%[\KSame][t]
\KAngle{CBA}[55\DEG][l,b]
\KAngle{BAC}[45\DEG][r,b]
\Circumcenter{ABC}{P}%[O][t]
\Kput{P}{\circle{\KDiameter}}
\KPath{ABCA}
\Pnode{P}(\KRadius,-100){D}%[\KSame][b]
\KPath{ADB}
\KAngle{BDA}[$\theta$][t]
\end{PicDotC}
```

2.5.28 四角形の内接条件 (証明)



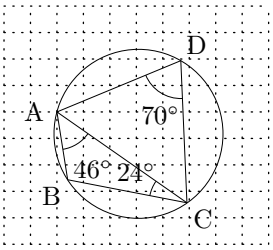

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}%[\KSame][r]
\KArc[8]{O}(140,120)
\Pnode(4,130){A}[\KSame][lt]
\Pnode(4,205){B}[\KSame][l]
\Pnode(4,330){C}[\KSame][r]
\Pnode(4, 40){D}[\KSame][t]
\Pnode(4, 95){E}[\KSame][t]
\KPath{ABCDA,DEB}
\end{PicDotC}
```

2.5.29 問 10(1)



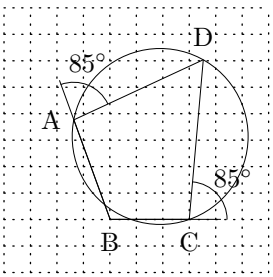

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}%[\KSame][r]
\Pnode(4,140){A}[\KSame][lt]
\Pnode(4,200){B}[\KSame][l]
\Pnode(4,320){C}[\KSame][r]
\Pnode(4, 50){D}[\KSame][t]
\KPath{ABCDA}
\KAngle{BAD}[105\DEG][b,l]
\KAngle{DCB}[75\DEG][t,r]
\end{PicDotC}
```

2.5.30 問 10(2)



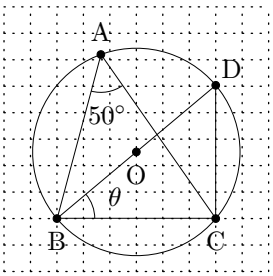

```
\unitlength=5mm
\begin{PicDot}(10,9)(-2,-5)
\Knode(0,0){O}%[\KSame][t]
\Knode(0,0){A}[\KSame][l]
\Pnode(6,-35){C}[\KSame][rb]
\Pnode{A}(4,-81){e}%[\KSame][t]
\Pnode{C}(4,169){f}%[\KSame][f]
\Intersection{Ae}{Cf}{B}[\KSame][lb]
\EKCircleArc{CA}{70}{E}%[\KSame][rt]
\Kput{E}{\circle{\KDiameter}}
\Pnode{E}(\KRadius,60){D}[\KSame][rt]
\KPath{ABCDAC}
\KAngle{BAC}[46\DEG][rb,t]
\KAngle{ACB}[24\DEG][lt,rb]
\KAngle{ADC}[70\DEG][b,rt]
\end{PicDot}
```

2.5.31 問 10(3)



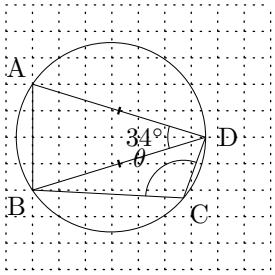

```
\unitlength=5mm
\begin{PicDot}(10,10)(-7,-6)
\Knode(0,0){O}%[\KSame][r]
\Knode(0,-4){C}[\KSame][b]
\Knode(-3,-4){B}[\KSame][b]
\Pnode{B}(4,110){A}[\KSame][l]
\Pnode{A}(4,25){a}%[\KSame][t]
\Pnode{C}(4,85){c}%[\KSame][t]
\Intersection{Aa}{Cc}{D}[\KSame][t]
\KPath{ABCDA}
\Circumcenter{ACD}{P}%[\KSame][t]
\Kput{P}{\circle{\KDiameter}}
\Enode{BC}(3.5:1){d}
\Enode{BA}(3.5:1){e}
\KAngle{dCD}[85\DEG][rt]
\KAngle{DAe}[85\DEG][t]
\KPath{eBd}
\end{PicDot}
```

2.5.32 問題 6(1)



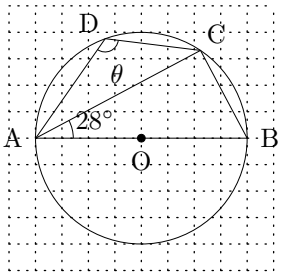

```
\unitlength=5mm
\begin{PicDot}(10,10)(-5,-5)
\Knode*(-3,-3){B}[\KSame][b]
\Knode*(3,-3){C}[\KSame][b]
\EKCircleArc*{CB}{50}{S}[O][b]
\Kput{S}{\circle{\KDiameter}}
\Pnode*{S}(\KRadius,110){A}[\KSame][t]
\EKCircleLineFar*{BS}(S,\KDiameter){D}[\KSame][rt]
\KPath{BCDBAC}
\KAngle{BAC}[50\DEG][b,lt]
\KAngle{CBD}[$\theta$][r,b]
\end{PicDot}
```

2.5.33 問題6 (2)



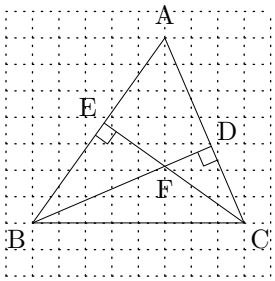

```
\unitlength=5mm                 \KAngle{DCB}[$\theta$][l,b]
\begin{PicDot}(10,10)(-5,-5)    \EKSameLength[1]{AD,BD}
\Knode(-4, 2){A}[\KSame][lt]    \end{PicDot}
\Knode(-4,-2){B}[\KSame][bl]
\EKCircleArc{BA}{34}{S}%[O][l]
\Kput{S}{\circle{\KDiameter}}
\Pnode{S}(\KRadius,0){D}[\KSame][r]
\Pnode{S}(\KRadius,-40){C}[\KSame][rb]
\KPath{BCDABD}
\KAngle{ADB}[34\DEG][l]
```

2.5.34 問題6 (3)



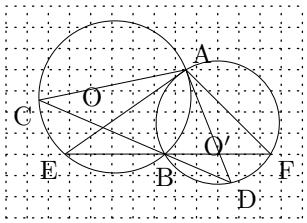

```
\unitlength=5mm                 \KAngle{BAC}[28\DEG][r,b]
\begin{PicDotC}(10,10)          \KAngle[1]{ADC}[$\theta$][b,l]
\Knode*(0,0){O}[\KSame][b]      \end{PicDotC}
\Kput{O}{\circle{8}}
\Pnode(4,180){A}[\KSame][l]
\Pnode(4,  0){B}[\KSame][r]
\Pnode{A}(4,28){c}%[\KSame][b]
\EKCircleLineFar{Ac}(O,8){C}[\KSame][rt]
\Pnode(4,110){D}[\KSame][tl]
\KPath{ABCDAC}
```

2.5.35 問題7



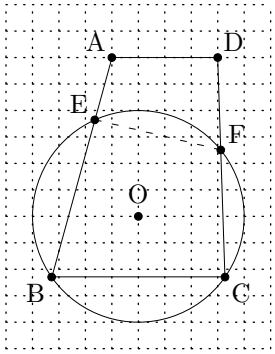

```
\unitlength=5mm                 \Intersection{BD}{CE}{F}[\KSame][b]
\begin{PicDot}(10,10)(-5,-5)    \end{PicDot}
\Knode(-4,-3){B}[\KSame][lb]
\Knode( 4,-3){C}[\KSame][rb]
\Knode( 1, 4){A}[\KSame][t]
\Perpendicularfoot{AC}{B}{D}[\KSame][rt]
\Perpendicularfoot{AB}{C}{E}[\KSame][lt]
\EKNinty{BDC,BEC}
\KPath{ABCA,BD,CE}
```

2.5.36 問題8




```
\unitlength=5mm                         \EKCircleLineFar{Bb}(S,\KDiameter){E}[\KSame][lb]
\begin{PicDot}(14,10)(-8,-5)            \EKCircleLineFar{Bc}(S,\KDiameter){C}[\KSame][lb]
\Knode( 0.5, 2){A}[\KSame][rt]          \EKCircleArc{BA}{45}{T}[O$'$][b]
\Knode(-0.5,-2){B}[\KSame][b]           \Kput{T}{\circle{\KDiameter}}
\Knode(-7,-2){b}%[\KSame][b]            \EKCircleLineFar{bB}(T,\KDiameter){F}[\KSame][rb]
\Knode(-7,0.8){c}%[\KSame][b]           \EKCircleLineFar{cB}(T,\KDiameter){D}[\KSame][rb]
\EKCircleArc{AB}{35}{S}[O][l]           \KPath{AEFACDA}
\Kput{S}{\circle{\KDiameter}}           \end{PicDot}
```

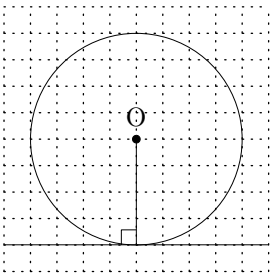
2.5.37 問題9




```
\unitlength=4.5mm                                   \end{PicDot}
\begin{PicDot}(10,13)(-5,-5)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle{8}}
\Pnode*(4,215){B}[\KSame][lb]
\Pnode*(4,-35){C}[\KSame][rb]
\Knode*(-1, 6){A}[\KSame][lt]
\Knode*( 3, 6){D}[\KSame][rt]
\EKCircleLineFar*{BA}(O,8){E}[\KSame][lt]
\EKCircleLineFar*{CD}(O,8){F}[\KSame][rt]
\KPath{ABCDA}
\KPen{\dashline{0.3}}
\KPath{EF}
```

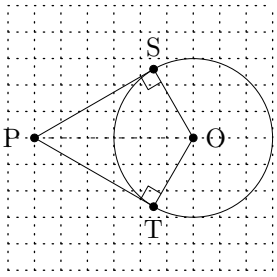
2.6 円と直線

2.6.1 円と接線



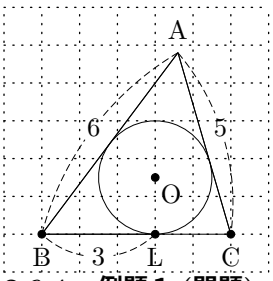

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][t]
\Kput{O}{\circle{8}}
\Knode(-5,-4){A}%[\KSame][b]
\Knode( 5,-4){B}%[\KSame][b]
\KPath{AB}
\Perpendicularfoot{AB}{O}{H}
\KPath{OH}
\KNinty{OHA}
\end{PicDotC}
```

2.6.2 接線の長さ (証明)



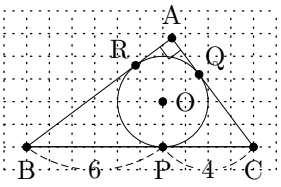

```
\unitlength=5mm
\begin{PicDot}(10,10)(-7,-5)
\Knode*(0,0){O}[\KSame][r]
\Kput{O}{\circle{6}}
\Knode*(-6,0){P}[\KSame][l]
\EKTangentPtR*{P}(O,3){S}[\KSame][t]
\EKTangentPtL*{P}(O,3){T}[\KSame][b]
\KPath{OSPTO}
\KPen{\dashline{0.2}}
\KPath{PO}
\EKNinty{PSO,OTP}
\end{PicDot}
```

2.6.3 問１



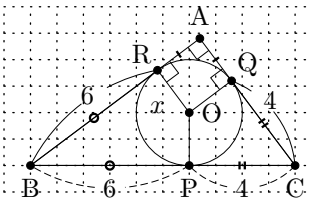

```
\unitlength=7mm
\begin{PicDot}(7,7)(-1,-1)
%\Knode*( 0, 0){O}[\KSame][r]
\Knode*(0,0){B}[\KSame][b]
\Knode*(5,0){C}[\KSame][b]
\Inode*{BC}(3:2){L}[\KSame][b]
\TwoCirclesLeft{BC}(6,5){A}[\KSame][t]
\Incenter*{ABC}{o}[O][rb]
\KPath{ABCA}
\Kput{o}{\circle{\KDiameter}}
\KLineDashArc{BL}[3][b]
\KLineDashArc{AB}[6][lt]
\KLineDashArc{AC}[5][rt]
\end{PicDot}
```

2.6.4 例題１ (問題)



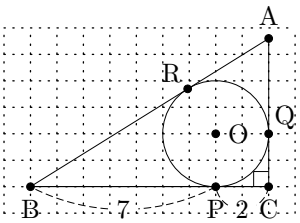

```
\unitlength=5mm
\begin{PicDot}(12,7)(-7,-3)
\Knode*( 0, 0){O}[\KSame][r]
\Knode*(-6,-2){B}[\KSame][b]
\Knode*( 4,-2){C}[\KSame][b]
\Inode*{BC}(6:4){P}[\KSame][b]
\EKTangentPtR*{B}(O,2){R}[\KSame][lt]
\EKTangentPtL*{C}(O,2){Q}[\KSame][rt]
\Intersection*{BR}{CQ}{A}[\KSame][t]
\KPath{ABCA}
\Kput{O}{\circle{4}}
\KNinty{BAC}
\KLineDashArc{BP}[6][b]
\KLineDashArc{PC}[4][b]
\end{PicDot}
```

2.6.5 例題１ (証明)



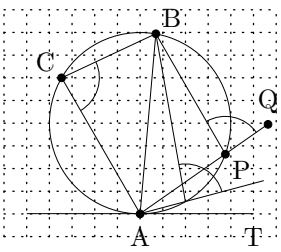

```
\unitlength=5mm
\begin{PicDot}(12,7)(-7,-3)
\Knode*( 0, 0){O}[\KSame][r]
\Knode*(-6,-2){B}[\KSame][b]
\Knode*( 4,-2){C}[\KSame][b]
\Inode*{BC}(6:4){P}[\KSame][b]
\EKTangentPtR*{B}(O,2){R}[\KSame][lt]
\EKTangentPtL*{C}(O,2){Q}[\KSame][rt]
\Intersection*{BR}{CQ}{A}[\KSame][t]
\KPath{ABCA}
\Kput{O}{\circle{4}}
\KNinty{BAC}
\KLineDashArc{BP}[6][b]
\KLineDashArc{PC}[4][b]
\KLineArc{BR}[6][t,r]
\KLineArc{CQ}[4][t,l]
\EKNinty{ARO,AQO}
\KPath{OP,OQ,OR}
\EKSameLength[0]{BR,BP}
\EKSameLength[2]{CQ,CP}
\EKSameLength[1]{AR,AQ}
\KLineName{RO}[$x$][lb]
\end{PicDot}
```

2.6.6 問2



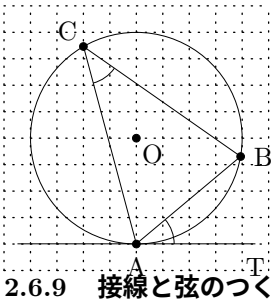

```
\unitlength=5mm
\begin{PicDot}(11,7)(-8,-3)
\Knode*( 0, 0){O}[\KSame][r]
\Knode*(-7,-2){B}[\KSame][b]
\Knode*( 2,-2){C}[\KSame][b]
\Inode*{BC}(7:2){P}[\KSame][b]
\EKTangentPtR*{B}(0,2){R}[\KSame][lt]
\EKTangentPtL*{C}(0,2){Q}[\KSame][rt]
\Intersection*{BR}{CQ}{A}[\KSame][t]
\KPath{ABCA}
\Kput{O}{\circle{4}}
\KNinty{BCA}
\KLineDashArc{BP}[7][b]
\KLineDashArc{PC}[2][b]
\end{PicDot}
```

2.6.7 接線と弦のつくる角



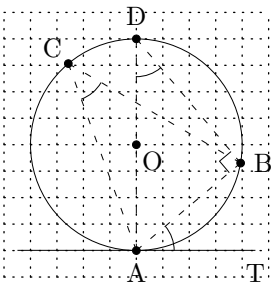

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}
\Kput{O}{\circle{8}}
\Knode( 5,-4){T}[\KSame][b]
\Knode(-5,-4){S}
\KPath{ST}
\Knode*( 0,-4){A}[\KSame][b]
\Pnode*(4,80){B}[\KSame][tr]
\Pnode*(4,150){C}[\KSame][lt]
\Pnode*(4,-20){P}[\KSame][rb]
\Enode*{AP}(3:1){Q}[\KSame][t]
\Pnode(4,-60){p}
\Enode{Ap}(3:1.9){q}
\KPath{ABCA,AQ,BP,Aq,Bp}
\KAngle{ACB,QPB,qpB}
\end{PicDotC}
```

2.6.8 接線と弦のつくる角 (定理)



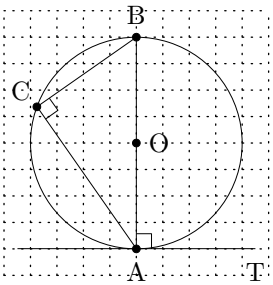

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][rb]
\Kput{O}{\circle{8}}
\Knode*(0,-4){A}[\KSame][b]
\Knode(4.5,-4){T}[\KSame][b]
\Knode(-4.5,-4){S}
\KPath{ST}
\Pnode*(4,-10){B}[\KSame][r]
\Pnode*(4,120){C}[\KSame][lt]
\KPath{ABCA}
\KAngle{ACB,TAB}
\end{PicDotC}
```

2.6.9 接線と弦のつくる角 (証明) 1



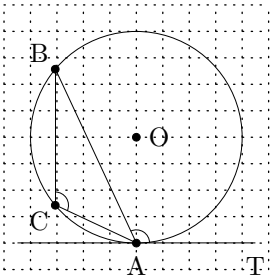

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][rb]
\Kput{O}{\circle{8}}
\Knode*(0,-4){A}[\KSame][b]
\Knode(4.5,-4){T}[\KSame][b]
\Knode(-4.5,-4){S}
\Pnode*(4,-10){B}[\KSame][r]
\Pnode*(4,130){C}[\KSame][lt]
\KPath{ST,ABCA}
\KAngle{ACB,TAB}
\Pnode*(4,90){D}[\KSame][t]
\KPen{\dashline{0.3}}
\KPath{ADB}
\KAngle{ADB}
\KNinty{DBA}
\end{PicDotC}
```

2.6.10 接線と弦のつくる角 (証明) 2



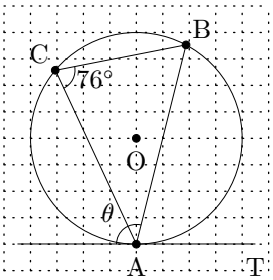

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][r]
\Kput{O}{\circle{8}}
\Knode*(0,-4){A}[\KSame][b]
\Knode(4.5,-4){T}[\KSame][b]
\Knode(-4.5,-4){S}
\Pnode*(4,90){B}[\KSame][t]
\Pnode*(4,160){C}[\KSame][lt]
\KPath{ST,ABCA}
\EKNinty{ACB,TAB}
\end{PicDotC}
```

2.6.11 問3



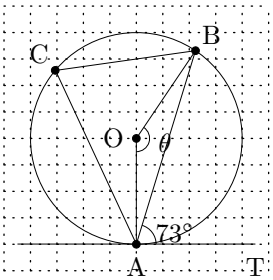

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][r]
\Kput{O}{\circle{8}}
\Knode*(0,-4){A}[\KSame][b]
\Knode(4.5,-4){T}[\KSame][b]
\Knode(-4.5,-4){S}
\Pnode*(4,140){B}[\KSame][lt]
\Pnode*(4,220){C}[\KSame][lb]
\KPath{ST,ABCA}
\KAngle[1]{ACB,TAB}
\end{PicDotC}
```

2.6.12 問 4(1)



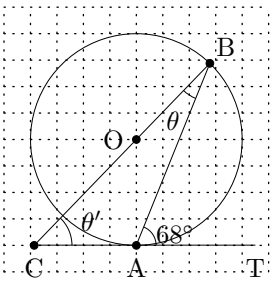

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][b]
\Kput{O}{\circle{8}}
\Knode*(0,-4){A}[\KSame][b]
\Knode(4.5,-4){T}[\KSame][b]
\Knode(-4.5,-4){S}
\Pnode*(4,62){B}[\KSame][rt]
\Pnode*(4,140){C}[\KSame][lt]
\KPath{ST,ABCA}
\KAngle[1.5]{ACB}[76\DEG][r]
\KAngle[1.5]{BAS}[$\theta$][lt]
\end{PicDotC}
```

2.6.13 問 4(2)



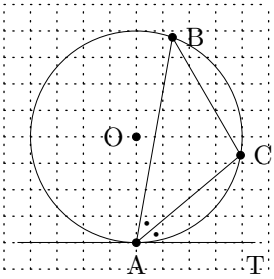

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][l]
\Kput{O}{\circle{8}}
\Knode*(0,-4){A}[\KSame][b]
\Knode(4.5,-4){T}[\KSame][b]
\Knode(-4.5,-4){S}
\Pnode*(4,56){B}[\KSame][rt]
\Pnode*(4,140){C}[\KSame][lt]
\KPath{ST,ABCA,AOB}
\KAngle[1.5]{TAB}[73\DEG][r]
\KAngle[1]{AOB}[$\theta$][r,r]
\end{PicDotC}
```

2.6.14 問4 (3)



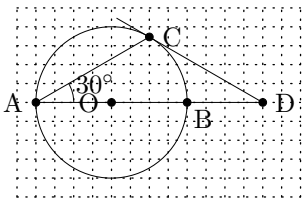

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][l]
\Kput{O}{\circle{8}}
\Knode*(0,-4){A}[\KSame][b]
\Knode(4.5,-4){T}[\KSame][b]
\Pnode*(4,46){B}[\KSame][rt]
\Intersection*{BO}{TA}{C}[\KSame][b]
\KPath{AT,ABCA}
\KAngle[1.5]{TAB}[68\DEG][r]
\KAngle{OBA}[$\theta$][bl,t]
\KAngle{ACB}[$\theta'$][r,b]
\end{PicDotC}
```

2.6.15 例1



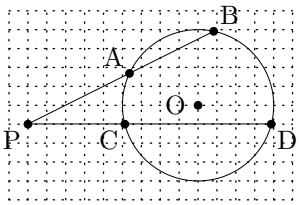

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][l]
\Kput{O}{\circle{8}}
\Knode*(0,-4){A}[\KSame][b]
\Knode(4.5,-4){T}[\KSame][b]
\Knode(-4.5,-4){S}
\Pnode{A}(4,40){c}%[\KSame][b]
\Pnode{A}(4,80){b}%[\KSame][t]
\EKCircleLineFar*{Ac}(O,8){C}[\KSame][r]
\EKCircleLineFar*{Ab}(O,8){B}[\KSame][r]
\KPath{TS,ABCA}
\EKAngle{TAC,CAB}{・}
\end{PicDotC}
```

2.6.16 問5



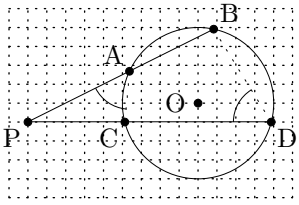

```
\unitlength=4mm
\begin{PicDot}(15,10)(-5,-5)
\Knode*(0,0){O}[\KSame][l]
\Kput{O}{\circle{8}}
\Knode*(-4,0){A}[\KSame][l]
\Knode*( 4,0){B}[\KSame][rb]
\Pnode{A}(4,30){c}%[\KSame][rt]
\EKCircleLineFar*{Ac}(O,8){C}[\KSame][r]
\EKLPerpgram{COC}{2}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){d}%[\KSame][t]
\Intersection*{Cd}{AB}{D}[\KSame][r]
\KPath{dDAC}
\KAngle{OAC}[30\DEG][r,b]
\end{PicDot}
```

2.6.17 方べきの定理 (1)(定理)



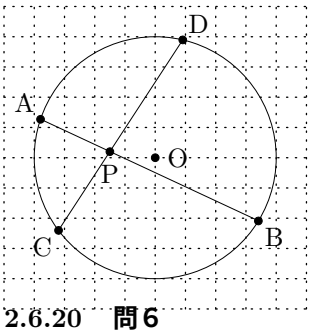

```
\unitlength=4mm
\begin{PicDot}(15,10)(-10,-5)
\Knode*(0,0){O}[\KSame][l]
\Kput{O}{\circle{8}}
\Knode*(-9,-1){P}[\KSame][lb]
\Knode(-8,-1){c}%[\KSame][b]
\EKCircleLineNear*{Pc}(O,8){C}[\KSame][lb]
\EKCircleLineFar*{Pc}(O,8){D}[\KSame][rb]
\Knode(-7,0){a}%[\KSame][t]
\EKCircleLineNear*{Pa}(O,8){A}[\KSame][lt]
\EKCircleLineFar*{Pa}(O,8){B}[\KSame][rt]
\KPath{BPD}
\end{PicDot}
```

2.6.18 方べきの定理 (1)(証明)



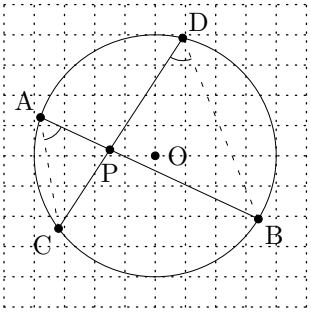

```
\unitlength=4mm
\begin{PicDot}(15,10)(-10,-5)
\Knode*(0,0){O}[\KSame][l]
\Kput{O}{\circle{8}}
\Knode*(-9,-1){P}[\KSame][lb]
\Knode(-8,-1){c}%[\KSame][b]
\EKCircleLineNear*{Pc}(O,8){C}[\KSame][lb]
\EKCircleLineFar*{Pc}(O,8){D}[\KSame][rb]
\Knode(-7,0){a}%[\KSame][t]
\EKCircleLineNear*{Pa}(O,8){A}[\KSame][lt]
\EKCircleLineFar*{Pa}(O,8){B}[\KSame][rt]
\KPath{BPD}
\KAngle{PAC,BDP}
\KPen{\dashline{0.2}}
\KPath{AC,BD}
\end{PicDot}
```

2.6.19 方べきの定理 (2)(定理)



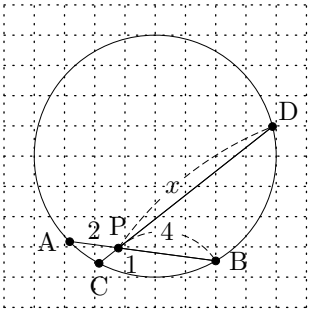

```
\unitlength=4mm
\begin{PicDot}(10,10)(-5,-5)
\Knode*(0,0){O}[\KSame][r]
\Kput{O}{\circle{8}}
\Knode*(-1.5,0.2){P}[\KSame][b]
\Knode(  0,2.5){c}%[\KSame][b]
\EKCircleLineNear*{Pc}(O,8){C}[\KSame][lb]
\EKCircleLineFar*{Pc}(O,8){D}[\KSame][rt]
\Knode(  0,-0.5){a}%[\KSame][t]
\EKCircleLineNear*{Pa}(O,8){A}[\KSame][lt]
\EKCircleLineFar*{Pa}(O,8){B}[\KSame][rb]
\KPath{AB,CD}
\end{PicDot}
```

2.6.20 問6



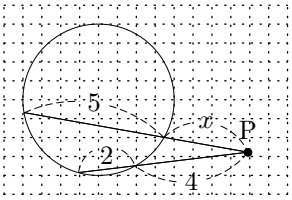

```
\unitlength=4mm
\begin{PicDot}(10,10)(-5,-5)
\Knode*(0,0){O}[\KSame][r]
\Kput{O}{\circle{8}}
\Knode*(-1.5,0.2){P}[\KSame][b]
\Knode(  0,2.5){c}%[\KSame][b]
\EKCircleLineNear*{Pc}(O,8){C}[\KSame][lb]
\EKCircleLineFar*{Pc}(O,8){D}[\KSame][rt]
\Knode(  0,-0.5){a}%[\KSame][t]
\EKCircleLineNear*{Pa}(O,8){A}[\KSame][lt]
\EKCircleLineFar*{Pa}(O,8){B}[\KSame][rb]
\KPath{AB,CD}
\KAngle[1.5]{CAP,PDB}
\KPen{\dashline{0.2}}
\KPath{AC,BD}
\end{PicDot}
```

2.6.21 問7 (1)



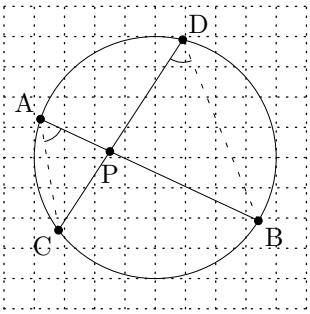

```
\unitlength=4mm
\begin{PicDot}(10,10)(-5,-5)
\Knode(0,0){O}%[\KSame][r]
\Kput{O}{\circle{8}}
\Pnode*(4,-60){B}[\KSame][r]
\Pnode*(4,-135){A}[\KSame][l]
\KPath{AB}
\Inode*{AB}(2:4){P}[\KSame][t]
\EKDistance{AB}{\tmpA}
\Div{\tmpA}{6}{\tmpA}
\TwoCirclesRight*{OP}(4,\tmpA){C}[\KSame][b]
\EKCircleLineFar*{CP}(O,8){D}[\KSame][tr]
\KPath{CD}
\KLineName{AP}[2][t,t]
\KLineDashArc{PB}[4][t]
\KLineName{CP}[1][r,t]
\KLineDashArc{PD}[$x$][l]
\end{PicDot}
```

2.6.22 問7 (2)



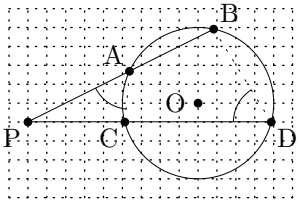

```
\unitlength=4mm
\begin{PicDot}(15,10)(-5,-5)
\Knode(0,0){O}%[\KSame][r]
\Kput{O}{\circle{8}}
\Pnode(4,-30){B}%[\KSame][r]
\Pnode(4, 190){A}%[\KSame][l]
\Enode*{AB}(8:3){P}[\KSame][t]
\EKDistance{AB}{\tmpA}
\Mul{\tmpA}{4}{\tmpA}
\Div{\tmpA}{5}{\tmpA}
\TwoCirclesRight{OP}(4,\tmpA){D}%[\KSame][b]
\EKCircleLineFar{PD}(O,8){C}%[\KSame][tr]
\KPath{APC}
\KLineDashArc{AB}[5][t]
\KLineDashArc{BP}[$x$][t]
\KLineDashArc{CD}[2][t,t]
\KLineDashArc{DP}[4][b]
\end{PicDot}
```

2.6.23 例題2



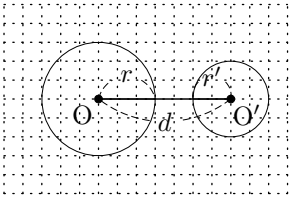

```
\unitlength=4mm
\begin{PicDot}(10,10)(-5,-5)
\Knode(0,0){O}%[\KSame][r]
\Kput{O}{\circle{8}}
\Knode*(-1.5,0.2){P}[\KSame][b]
\Knode(  0,2.5){c}%[\KSame][b]
\EKCircleLineNear*{Pc}(O,8){C}[\KSame][lb]
\EKCircleLineFar*{Pc}(O,8){D}[\KSame][rt]
\Knode(  0,-0.5){a}%[\KSame][t]
\EKCircleLineNear*{Pa}(O,8){A}[\KSame][lt]
\EKCircleLineFar*{Pa}(O,8){B}[\KSame][rb]
\KPath{AB,CD}
\KAngle[1.5]{CAP,PDB}
\KPen{\dashline{0.2}}
\KPath{AC,BD}
\end{PicDot}
```

2.6.24 問8



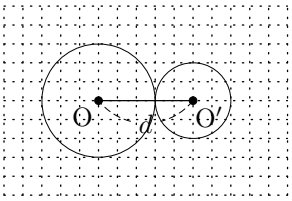

```
\unitlength=4mm
\begin{PicDot}(15,10)(-10,-5)
\Knode*(0,0){O}[\KSame][l]
\Kput{O}{\circle{8}}
\Knode*(-9,-1){P}[\KSame][lb]
\Knode(-8,-1){c}%[\KSame][b]
\EKCircleLineNear*{Pc}(O,8){C}[\KSame][lb]
\EKCircleLineFar*{Pc}(O,8){D}[\KSame][rb]
\Knode(-7,0){a}%[\KSame][t]
\EKCircleLineNear*{Pa}(O,8){A}[\KSame][lt]
\EKCircleLineFar*{Pa}(O,8){B}[\KSame][rt]
\KPath{BPD}
\KAngle{PAC,BDP}
\KPen{\dashline{0.2}}
\KPath{AC,BD}
\end{PicDot}
```

2.6.25 2つの円1



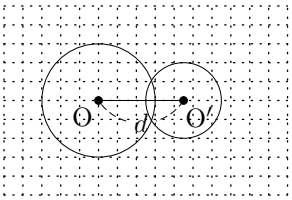

```
\unitlength=4mm
\begin{PicDot}(15,10)(-5,-5)
\Knode*(0,0){O}[\KSame][lb]
\Knode*(7,0){o}[O$'$][rb]
\Knode(3,0){A}%[\KSame][rt]
\Knode(5,0){B}%[\KSame][lt]
\Kput{O}{\circle6}
\Kput{o}{\circle4}
\KPath{Oo}
\KLineDashArc{Oo}[$d$][b]
\KLineDashArc{OA}[$r$][t]
\KLineDashArc{Bo}[$r'$][t]
\end{PicDot}
```

2.6.26 2つの円2



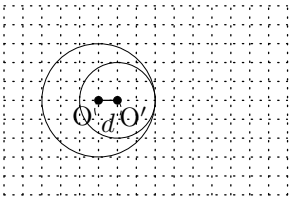

```
\unitlength=4mm
\begin{PicDot}(15,10)(-5,-5)
\Knode*(0,0){O}[\KSame][lb]
\Knode*(5,0){o}[O$'$][rb]
\Kput{O}{\circle6}
\Kput{o}{\circle4}
\KPath{Oo}
\KLineDashArc{Oo}[$d$][b]
\end{PicDot}
```

2.6.27 2つの円3



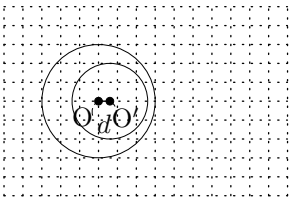

```
\unitlength=3mm
\begin{PicDot}(15,10)(-5,-5)
\Knode*(0,0){O}[\KSame][lb]
\Knode*(4.5,0){o}[O$'$][rb]
\Kput{O}{\circle6}
\Kput{o}{\circle4}
\KPath{Oo}
\KLineDashArc{Oo}[$d$][b]
\end{PicDot}
```

2.6.28 2つの円4



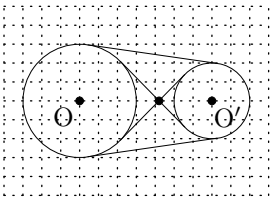

```
\unitlength=3mm
\begin{PicDot}(15,10)(-5,-5)
\Knode*(0,0){O}[\KSame][lb]
\Knode*(1,0){o}[O$'$][rb]
\Kput{O}{\circle6}
\Kput{o}{\circle4}
\KPath{Oo}
\KLineDashArc{Oo}[$d$][b]
\end{PicDot}
```

2.6.29 2つの円5



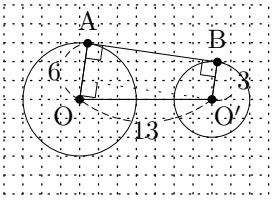

```
\unitlength=4mm
\begin{PicDot}(15,10)(-5,-5)
\Knode*(0,0){O}[\KSame][lb]
\Knode*(0.6,0){o}[O$'$][rb]
\Kput{O}{\circle6}
\Kput{o}{\circle4}
\KPath{Oo}
\KLineDashArc{Oo}[$d$][b]
\end{PicDot}
```

2.6.30 2つの円6



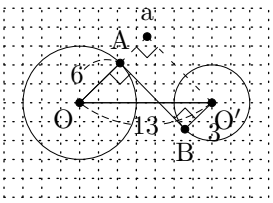

```
\unitlength=6mm
\begin{PicDot}(15,10)(-5,-5)
\Knode*(0,0){O}[\KSame][lb]
\Knode*(7,0){o}[O$'$][rb]
\Knode(3,0){A}%[\KSame][rt]
\Knode(5,0){B}%[\KSame][lt]
\Kput{O}{\circle6}
\Kput{o}{\circle4}
\Inode*{Oo}(6:4){P}%[\KSame][t]
\EKTangentPtL{P}(O,3){Q}%[\KSame][t]
\EKTangentPtR{P}(O,3){R}%[\KSame][t]
\EKTangentPtR{P}(o,2){S}%[\KSame][t]
\EKTangentPtL{P}(o,2){T}%[\KSame][t]
\KPath{QT,SR}
\Enode{Oo}(6:4){p}
\EKTangentPtL{p}(O,3){q}%[\KSame][t]
\EKTangentPtR{p}(O,3){r}%[\KSame][b]
\EKTangentPtL{p}(o,2){s}%[\KSame][t]
\EKTangentPtR{p}(o,2){t}%[\KSame][b]
\KPath{rt,qs}
\end{PicDot}
```

2.6.31 問 11(1)



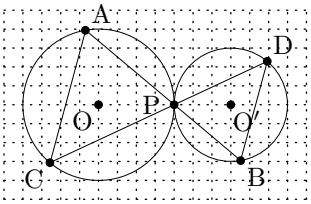

```
\unitlength=4mm
\begin{PicDot}(15,10)(-5,-5)
\Knode*(0,0){O}[\KSame][lb]
\Knode*(7,0){o}[O$'$][rb]
\Knode(3,0){A}%[\KSame][rt]
\Knode(5,0){B}%[\KSame][lt]
\Kput{O}{\circle6}
\Kput{o}{\circle4}
\Enode{Oo}(6:4){p}
\EKTangentPtL*{p}(0,3){A}[\KSame][t]
\EKTangentPtL*{p}(o,2){B}[\KSame][t]
\KPath{AB,AOoB}
\Perpendicularfoot{AO}{o}{H}%[\KSame][l]
\KPen{\dashline{0.2}}
\KPath{oH}
\EKNinty{OAB,ABo,OHo}
\KLineDashArc{AO}[6][l,r]
\KLineDashArc{Oo}[13][b,t]
\KLineDashArc{Bo}[3][r,l]
\end{PicDot}
```

2.6.32 問 11(2)



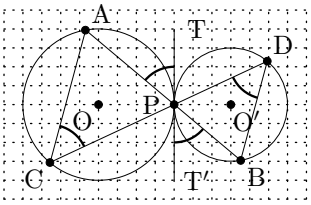

```
\unitlength=2.5mm
\begin{PicDot}(15,10)(-5,-5)
\Knode*(0,0){O}[\KSame][lb]
\Knode*(7,0){o}[O$'$][rb]
\Kput{O}{\circle6}
\Kput{o}{\circle4}
\Inode{Oo}(6:4){P}%[\KSame][t]
\EKTangentPtL*{P}(0,3){A}[\KSame][t]
\EKTangentPtL*{P}(o,2){B}[\KSame][b]
\KPath{oOABo}
\KLineDashArc{Oo}[13][b]
\KLineDashArc{OA}[6][l,b]
\KLineName{oB}[3][rb]
\EKDistance{Bo}{\tmpA}
\EKLParagram{AOA}{\tmpA}(\tmpB,\tmpC)
\Knode*(\tmpB,\tmpC){a}[\KSame][t]
\KPen{\dashline{0.4}}
\KPath{Aao}
\EKNinty{OAB,Oao,oBA}
\end{PicDot}
```

2.6.33 例題 3



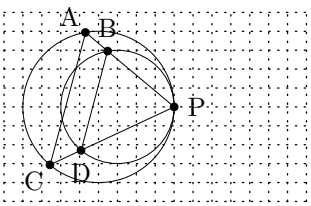

```
\unitlength=3mm
\begin{PicDot}(16,10)(-5,-5)
\Knode*(0,0){O}[\KSame][lb]
\Knode*(7,0){o}[O$'$][rb]
\Pnode*{O}(4,100){A}[\KSame][rt]
\Pnode*{O}(4,230){C}[\KSame][lb]
\Inode*{Oo}(4:3){P}[\KSame][l]
\EKCircleLineFar*{AP}(o,6){B}[\KSame][rb]
\EKCircleLineFar*{CP}(o,6){D}[\KSame][rt]
\Kput{O}{\circle8}
\Kput{o}{\circle6}
\KPath{ACDBA}
\end{PicDot}
```

2.6.34 例題 3(証明)



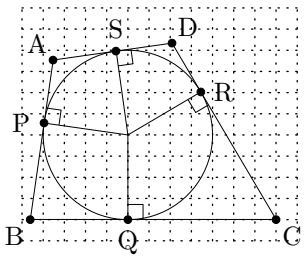

```
\unitlength=2.5mm
\begin{PicDot}(16,10)(-5,-5)
\Knode*(0,0){O}[\KSame][lb]
\Knode*(7,0){o}[O$'$][rb]
\Pnode*{O}(4,100){A}[\KSame][rt]
\Pnode*{O}(4,230){C}[\KSame][lb]
\Inode*{Oo}(4:3){P}[\KSame][l]
\EKCircleLineFar*{AP}(o,6){B}[\KSame][rb]
\EKCircleLineFar*{CP}(o,6){D}[\KSame][rt]
\Kput{O}{\circle8}
\Kput{o}{\circle6}
\KPath{ACDBA}
\EKLPerpgram{oOP}{4}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){T}[\KSame][r]
\EKLPerpgram{OoP}{4}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){t}[T$'$][r]
\KPath{Tt}
\thicklines
\KAngle{PCA,TPA,tPB,PDB}
\end{PicDot}
```

2.6.35 問 12



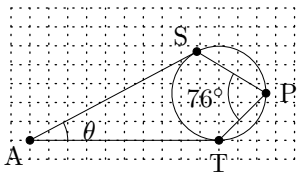

```
\unitlength=3mm
\begin{PicDot}(16,10)(-5,-5)
\Knode(0,0){O}%[\KSame][lb]
\Knode(1,0){o}%[O$'$][rb]
\Pnode*{O}(4,100){A}[\KSame][lt]
\Pnode*{O}(4,230){C}[\KSame][lb]
\Enode*{Oo}(4:3){P}[\KSame][r]
\EKCircleLineNear*{AP}(o,6){B}[\KSame][t]
\EKCircleLineNear*{CP}(o,6){D}[\KSame][b]
\Kput{O}{\circle8}
\Kput{o}{\circle6}
\KPath{BPCABD}
\end{PicDot}
```

2.6.36 問題 10



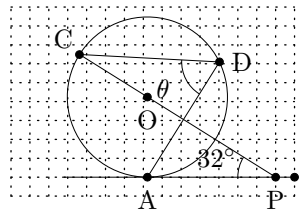

```
\unitlength=2.5mm
\begin{PicDot}(13,11)(-5,-5)
\Knode(0,0){O}%[\KSame][lb]
\Pnode*{O}(5,135){A}[\KSame][lt]
\Knode*{O}(7,-4){C}[\KSame][rb]
\EKTangentPtR*{A}(O,4){S}[\KSame][t]
\EKTangentPtL*{A}(O,4){P}[\KSame][l]
\EKTangentPtR*{C}(O,4){Q}[\KSame][b]
\EKTangentPtL*{C}(O,4){R}[\KSame][r]
\Intersection*{AP}{CQ}{B}[\KSame][lb]
\Intersection*{AS}{CR}{D}[\KSame][rt]
\KPath{ABCDA,POR,SOQ}
\EKNinty{OPA,CQO,ORC,OSD}
\Kput{O}{\circle8}
\end{PicDot}
```

2.6.37 問題 11(1)



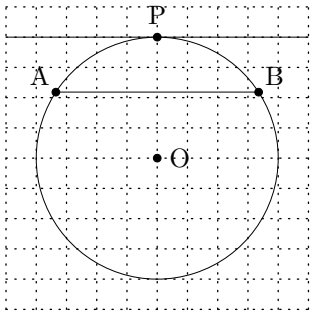

```
\unitlength=3mm
\begin{PicDot}(15,8)(-1,-1)
\Knode*(0,0){A}[\KSame][lb]
\Pnode*(10,0){T}[\KSame][b]
\Pnode*(10,28){S}[\KSame][lt]
\EKCircleArc{TS}{76}{o}%[\KSame][r]
\Kput{o}{\circle{\KDiameter}}
\Pnode*{o}(\KRadius,0){P}[\KSame][r]
\KAngle{SPT}[76\DEG][l]
\KAngle{TAS}[$\theta$][r]
\KPath{TASPT}
\end{PicDot}
```

2.6.38 問題 11(2)



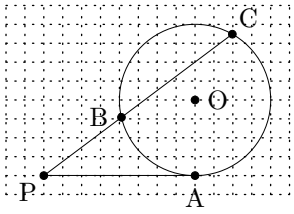

```
\unitlength=3mm
\begin{PicDot}(15,10)(-1,-1)
\Knode*(13,0){P}[\KSame][b]
\Knode*(14,0){T}[\KSame][r]
\Pnode*{P}(8,148){o}[O][b]
\Perpendicularfoot*{PT}{o}{A}[\KSame][b]
\EKDistance{oA}{\tmpA}
\Mul{\tmpA}{2}{\tmpB}
\Kput{o}{\circle{\tmpB}}
\EKTangentPtL*{P}(o,\tmpA){D}[\KSame][r]
\EKCircleLineFar*{Po}(o,\tmpB){C}[\KSame][lt]
\Enode{PA}(2:0.8){a}%[\KSame][b]
\KPath{aT,ADCP}
\KAngle{oPA}[32\DEG][l,b]
\KAngle{CDA}[$\theta$][l,t]
\end{PicDot}
```

2.6.39 問題 12



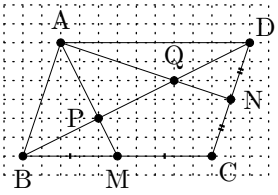

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode*(0,0){O}[\KSame][r]
\Kput{O}{\circle{8}}
\Pnode*(4,90){P}[\KSame][t]
\EKLPerpgram{OPP}{5}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){q}%[\KSame][t]
\EKLPerpgram{POP}{5}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){r}%[\KSame][t]
\Inode{OP}(1.2:1){c}%[\KSame][t]
\EKLPerpgram{OPc}{5}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){b}%[\KSame][t]
\EKCircleLineNear*{cb}(O,8){A}[\KSame][lt]
\EKCircleLineFar*{cb}(O,8){B}[\KSame][rt]
\KPath{AB,qr}
\end{PicDotC}
```

2.6.40 問題１３



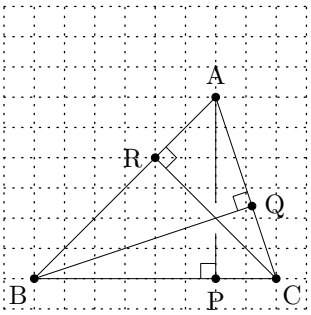

```
\unitlength=3mm
\begin{PicDot}(15,10)(-10,-5)
\Knode*(0,0){O}[\KSame][r]
\Kput{O}{\circle{8}}
\Knode*(0,-4){A}[\KSame][b]
\Knode*(-8,-4){P}[\KSame][lb]
\Knode(0,2){b}%[\KSame][t]
\EKCircleLineNear*{Pb}(O,8){B}[\KSame][l]
\EKCircleLineFar*{Pb}(O,8){C}[\KSame][rt]
\KPath{CPA}
\end{PicDot}
```

2.6.41 練習問題１



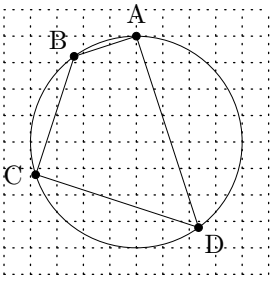

```
\unitlength=3mm
\begin{PicDot}(15,9)(-1,-1)
\Knode*(0,0){B}[\KSame][b]
\Knode*(2,6){A}[\KSame][t]
\Knode*(10,0){C}[\KSame][rb]
\Knode*(12,6){D}[\KSame][rt]
\KPath{BCDABD}
\Inode*{BC}(1:1){M}[\KSame][b]
\Inode*{CD}(1:1){N}[\KSame][r]
\EKSameLength[1]{BM,MC}
\EKSameLength[2]{CN,ND}
\Intersection*{BD}{AM}{P}[\KSame][l]
\Intersection*{BD}{AN}{Q}[\KSame][t]
\KPath{MAN}
\end{PicDot}
```

2.6.42 練習問題２



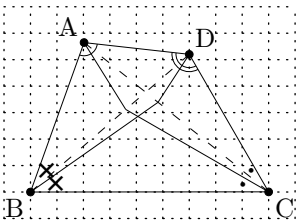

```
\unitlength=5mm
\begin{PicDot}(10,10)(-1,-1)
\Knode*(0,0){B}[\KSame][lb]
\Knode*(8,0){C}[\KSame][rb]
\Knode*(6,6){A}[\KSame][t]
\KPath{ABCA}
\Perpendicularfoot*{BC}{A}{P}[\KSame][b]
\Perpendicularfoot*{AC}{B}{Q}[\KSame][r]
\Perpendicularfoot*{AB}{C}{R}[\KSame][l]
\EKNinty{APB,AQB,CRA}
\KPath{AP}
\Intersection{AP}{BQ}{o}%[\KSame][t]
\Kput{o}{\solidcirclenobound{0}{1}}
\KPath{BQ,CR}
\end{PicDot}
```

2.6.43 練習問題３



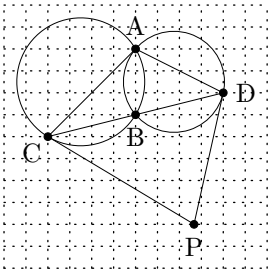

```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}
\Kput{O}{\circle{8}}
\Pnode*(4,90){A}[\KSame][t]
\Pnode*(4,126){B}[\KSame][lt]
\Pnode*(4,198){C}[\KSame][l]
\Pnode*(4,306){D}[\KSame][rb]
\KPath{ABCDA}
\end{PicDotC}
```

2.6.44 練習問題４



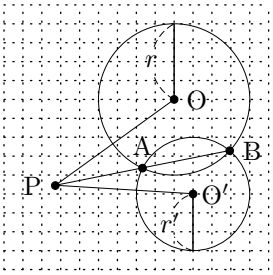

```
\unitlength=4mm
\begin{PicDot}(12,10)(-1,-1)
\Knode*(0,0){B}[\KSame][lb]
\Knode*(6,5.2){D}[\KSame][rt]
\Inode{BD}(1.5:1){e}%[\KSame][t]
\TwoCirclesLeft*{BD}(6,4){A}[\KSame][lt]
\TwoCirclesRight*{BD}(9,6){C}[\KSame][rb]
\KPath{ABCDAeC}
\EKDistance{AD}{\tmpA}
\EKDistance{DC}{\tmpB}
\Inode{AC}(\tmpA : \tmpB){f}%[\KSame][t]
\KPath{BfD}
\KPen{\dashline{0.4}}
\KPath{BD,AC}
\EKAngle[1]{fBA,CBf}{{\bf\small
×}}
\EKAngle[1]{eCB,DCf}{・}
\KAngle[1]{BAD,ADC}
\KAngle[1.3]{ADC}
\end{PicDot}
```

2.6.45 練習問題５



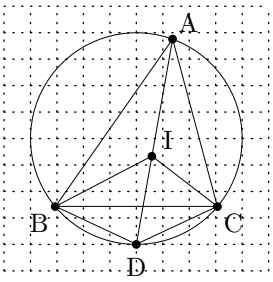

```
\unitlength=4mm
\begin{PicDot}(12,15)(-2,-6)
\Knode*(0,0){C}[\KSame][lb]
\Knode*(8,2){D}[\KSame][r]
\Knode*(4,4){A}[\KSame][t]
\Inode*{CD}(1:1){B}[\KSame][b]
\Circumcenter{ABC}{p}%[\KSame][t]
\Kput{p}{\circle{\KDiameter}}
\Circumcenter{ABD}{q}%[\KSame][t]
\Kput{q}{\circle{\KDiameter}}
\KPath{ACDA}
\EKPerpgram{CpC}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){c}%[\KSame][t]
\EKPerpgram{qDD}(\tmpA,\tmpB)
\Knode(\tmpA,\tmpB){d}%[\KSame][t]
\Intersection*{Cc}{Dd}{P}[\KSame][b]
\KPath{CPD}
\end{PicDot}
```

2.6.46 練習問題7




```
\unitlength=3mm
\begin{PicDot}(15,15)(-10,-10)
\Knode*(0,0){O}[\KSame][r]
\Knode*(1,-5){o}[O$'$][r]
\Kput{O}{\circle{8}}
\Kput{o}{\circle{6}}
\TwoCirclesRight*{Oo}(4,3){A}[\KSame][t]
\TwoCirclesLeft*{Oo}(4,3){B}[\KSame][r]
\Enode*{AB}(1:2){P}[\KSame][l]
\Pnode{O}(4,90){c}
\Pnode{o}(3,-90){d}
\KPath{BP,OPo,Oc,od}
\KLineDashArc{Oc}[$r$][l]
\KLineDashArc{od}[$r'$][l]
\end{PicDot}
```

2.6.47 練習問題8

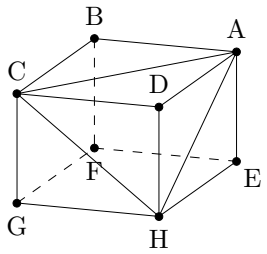



```
\unitlength=5mm
\begin{PicDotC}(10,10)
\Knode(0,0){O}%[\KSame][t]
\Kput{O}{\circle{8}}
\Pnode*(4,70){A}[\KSame][rt]
\Pnode*(4,220){B}[\KSame][lb]
\Pnode*(4,-40){C}[\KSame][rb]
\Incenter*{ABC}{I}[\KSame][rt]
\EKCircleLineFar*{AI}(0,8){D}[\KSame][b]
\KPath{ABCA,AD,BIC,BDC}
\end{PicDotC}
```

3 空間図形

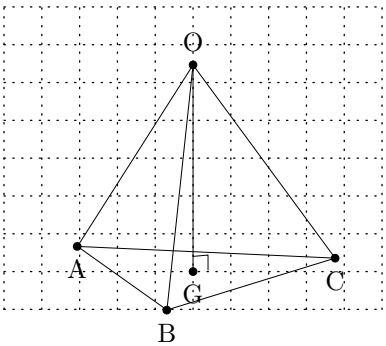
表示する領域の指定が、計算されたものなので、明示したときあわないことが多い。その場合には、PicDot を使って、実際に必要な領域を確保した後、Dot を削除すると良い。

3.1 空間図形の回転




```
\EKView(20,-15)% 図形を左に 20 度、下に 15 度回転させて表示する
\unitlength=5mm
\begin{Pic}(7,6)(-3,-3)
\Snode*(0,4,3){A}[\KSame][t]
\Snode*(0,0,3){B}[\KSame][t]
\Snode*(6,0,3){C}[\KSame][t]
\Snode*(6,4,3){D}[\KSame][t]
\Snode*(0,4,0){E}[\KSame][rb]
\Snode*(0,0,0){F}[\KSame][b]
\Snode*(6,0,0){G}[\KSame][b]
\Snode*(6,4,0){H}[\KSame][b]
\KPath{EAB,BCG,CDA,HD,HE,HG,AHCA}
\KPen{\dashpath}
\KPath{BF,GF,FE}
\end{Pic}
```

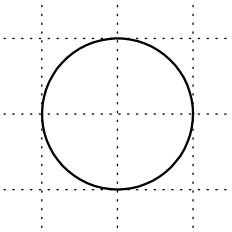
3.2 空間の極座標もどきによる配置




```
\EKView(10,-15)% 図形を左に 10 度、下に 15 度回転させて表示する
\unitlength=5mm
\begin{PicDot}(10,8)(-5,-1)
\SPnode*(4,0,0){B}[\KSame][b]%
\SPnode*(4,120,0){C}[\KSame][b]%
\SPnode*(4,240,0){A}[\KSame][b]%
\SPnode*(5.66,0,90){O}[\KSame][t]%
\Snode*(0,0,0){G}[\KSame][b]
\KPath{ABCA,AOB,CO,OG}
\KNinty{OGC}
\end{PicDot}
```

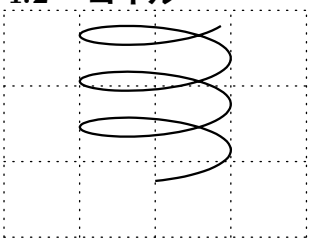
4 パラメータによる図形の描画

4.1 円



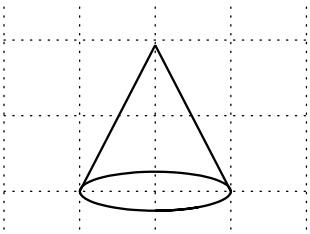
```
\unitlength=2cm
\begin{PicDotC}(3,3)
\thicklines
\PDraw(\Cos,\Sin)[0,6.4]%
\end{PicDotC}
```

4.2 コイル



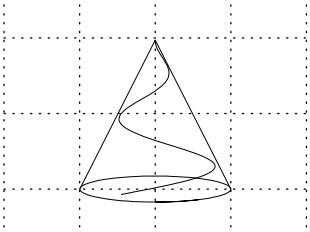
```
\EKView(0,-15)% 図形を下に 15 度回転させて表示する
\unitlength=1cm
\begin{PicDot}(4,3)(-2,-1)
\def\UsrFn#1#2{\Mul{#1}{0.1}{#2}}% y=0.1x
\thicklines
\PSDraw(\Cos,\Sin,\UsrFn)[0,20]%
\end{PicDot}}%
```

4.3 三角錐



```
\EKView(0,-15)% 図形を下に 15 度回転させて表示する
\unitlength=1cm
\begin{PicDot}(4,4)(-2,-1)
\def\UsrFn#1#2{\Sub{0}{0}{#2}}% y=0
\thicklines
\PSDraw(\Cos,\Sin,\UsrFn)[0,7]%
\Snode(0,0,2){P}
\Snode(0,-1,0){A}
\Snode(0,1,0){B}
\KPath{APB}
\end{PicDot}%
```

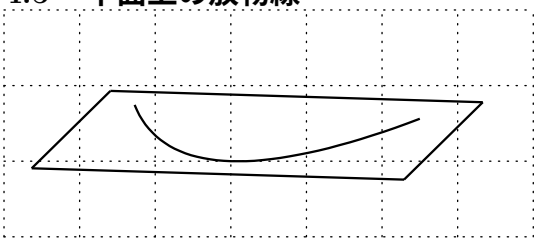
4.4 三角錐に巻き付く空間曲線



```
\EKView(0,-10)% 図形を手前下に 15 度回転させて表示する
\unitlength=1cm
\begin{PicDot}(4,3)(-2,-0.5)
\def\UsrFn#1#2{\Sub{0}{0}{#2}}% y=0
\def\UsrFnA#1#2{%
\Mul{#1}{0.1}{#2}% <-
\Cos{#2}{#2}%
\Mul{#2}{#1}{#2}%
\Mul{#2}{0.1}{#2}% <-
}%
\def\UsrFnB#1#2{%
\Mul{#1}{0.1}{#2}% <-
\Sin{#1}{#2}%
\Mul{#2}{#1}{#2}%
\Mul{#2}{0.1}{#2}% <-
```

```
}%
\def\UsrFnC#1#2{%
\Mul{#1}{0.1}{#2}% <-
\Sub{1}{#2}{#2}%
\Mul{#2}{2}{#2}%
}%
\PSDraw(\Cos,\Sin,\UsrFn)[0,7]%
\Snode(0,0,2){P}
\Snode(0,-1,0){A}
\Snode(0,1,0){B}
\KPath{APB}
\PSDraw(\UsrFnA,\UsrFnB,\UsrFnC)[0,10]
\end{PicDot}%
```

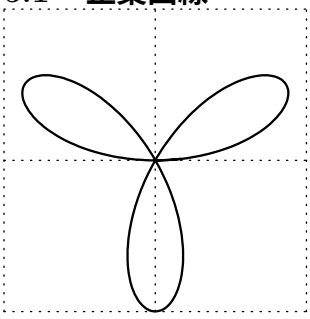
4.5 平面上の放物線



```
\EKView(-80,-10)% 図形を手前下に 15 度回転させて表示する
\unitlength=1cm
\begin{PicDot}(7,3)(-3,-1)
\def\UsrFn#1#2{\Sub{0}{0}{#2}}% y=0
\def\UsrFnA#1#2{\Mul{#1}{#1}{#2}}% y=x^2
\def\UsrFnB#1#2{\Add{#1}{0}{#2}}% y=x
\thicklines
\PSDraw(\UsrFnB,\UsrFnA,\UsrFn)[-2,2]%
\Snode(-2.5,-1,0){A}
\Snode(-2.5,5,0){B}
\Snode(2.5,5,0){C}
\Snode(2.5,-1,0){D}
\KPath{ABCDA}
\end{PicDot}%
```

5 極座標による曲線の描画

5.1 正葉曲線

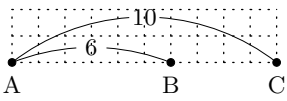


```
\unitlength=2cm
\begin{PicDotC}(2,2)%
\def\Fdx{0.01}%
\def\UsrFn#1#2{%
\Mul{#1}{3}{#2}%
\Sin{#2}{#2}%
}%
\thicklines%
\FDrawP{\UsrFn}[0,3.2]%
\end{PicDotC}%
```

6 覚え書き

kpic.sty を使う上での tips をここに集める。

6.1 線分の長さを書き込む位置




```
\unitlength=3.5mm
\begin{PicDot}(10,2)(0,0)
\Knode*(0,0){A}[\KSame][b]
\Knode*(6,0){B}[\KSame][b]
\Knode*(10,0){C}[\KSame][b]
\WordSep=2mm% <------------- 近づける
\KLineNameArc{AB}[6][t]
\WordSep=6mm% <------------- 離す
\KLineNameArc{AC}[10][t]
\WordSep=3mm% <------------- デフォルト
\end{PicDot}
```

6.2 空間における直角記号の扱い

\Kninty は、直角でなくても表示するが、\KView などにより、直角記号を構成する線分の長さが 0 になってしまうことがある。このような場合、現在はエラーになるので、その部分をコメントアウトする必要がある。