

```
[1]MyKinjiofp9Eng.java
```

```
/*
```

```
-----  
無限級数による $\pi$ の近似9 (英語版)  
Android 4.1 (Jelly Bean)  
Copyright (C) K. Niwa 2021. 9. 14  
-----
```

```
*/
```

```
package jp.kiyo.wuena.mykinjiofp9eng;
```

```
import android.content.Context;
```

```
import android.graphics.Canvas;
```

```
import android.graphics.Color;
```

```
import android.graphics.Paint;
```

```
import android.graphics.Rect;
```

```
import android.util.AttributeSet;
```

```
import android.view.View;
```

```
import android.content.res.Resources; //画像用
```

```
import android.graphics.*;
```

```
import android.view.*;
```

```
public class MyKinjiofp9Eng extends View {
```

```
    private Bitmap bitmap1 = null;
```

```
    int flag=0; //自動識別子
```

```
    int ct=0; //分子・分母の項の数
```

```
    int count; //ループカウンター
```

```
    double pai; // $\pi$ の近似値
```

```
    double s; // $\pi/8$ を求める過程での無限級数
```

```
    public MyKinjiofp9Eng(Context context) {
```

```
        super(context);
```

```
        init(context);
```

```
    }
```

```

public MyKinjiofp9Eng(Context context, AttributeSet attrs) {
    super(context, attrs);
    init(context);
}

public MyKinjiofp9Eng(Context context, AttributeSet attrs, int defStyle) {
    super(context, attrs, defStyle);
    init(context);
}

private void init(Context context) {
    Resources res = context.getResources(); //画像用
    bitmap1 = BitmapFactory.decodeResource(res, R.drawable.euler); //画像用
}

@Override
protected void onDraw(Canvas canvas) {
    // TODO 自動生成されたメソッド・スタブ

    float a=0;
    float b=0;

    super.onDraw(canvas);
    canvas.drawColor(Color.WHITE);
    Paint paint = new Paint();
    paint.setColor(Color.BLUE);
    paint.setAlpha(50);
    canvas.drawRect((getWidth()/2-360)+20, (getHeight()/2-600)+10, (getWidth()/2-
360)+700, (getHeight()/2-600)+1190, paint);

    paint.setAlpha(10000);
    paint.setColor(Color.BLUE);

    for (int i=0;i<3;i++) {
        canvas.drawLine((getWidth()/2-360)+20+i, (getHeight()/2-600)+10+i, (getWidth()/2-

```

```

360)+20+i, (getHeight()/2-600)+1190-i, paint);
        canvas.drawLine((getWidth()/2-360)+20+i, (getHeight()/2-600)+1190-i, (getWidth()/2-
360)+700-i, (getHeight()/2-600)+1190-i, paint);
        canvas.drawLine((getWidth()/2-360)+700-i, (getHeight()/2-600)+1190-i, (getWidth()/2-
360)+700-i, (getHeight()/2-600)+10+i, paint);
        canvas.drawLine((getWidth()/2-360)+700-i, (getHeight()/2-600)+10+i, (getWidth()/2-
360)+20+i, (getHeight()/2-600)+10+i, paint);
    }

    if (MainActivity.ritsu != 0) {
        a=(float) (1.0*320/MainActivity.ritsu); //----- <画像の
        拡大・縮小の横の倍率を指定する>
        b=(float) (1.0*320/MainActivity.ritsu); //----- <画像
        の拡大・縮小の縦の倍率を指定する>
    }
    else {
        a=(float) 1.0;
        b=(float) 1.0;
    }

    Matrix Mat = new Matrix(); //----- <画像を拡大・縮小す
    る>
    Mat.postScale(a, b); //-----
    Bitmap bitmap2 = Bitmap.createBitmap( //-----
        bitmap1, 0, 0, //-----
        bitmap1.getWidth(), //-----
        bitmap1.getHeight(), //-----
        Mat, true //-----
    ); //-----

    if (bitmap2 != null) {
        canvas.drawBitmap(bitmap2, (getWidth()/2-360)+250, (getHeight()/2-600)+150, paint);
    }

    paint.setTextSize(35.0f);
    canvas.drawText("【Approximation 9 of Pi by Infinite Series】", (getWidth()/2-360)+25,

```

```

(getHeight()/2-600)+80, paint);
    paint.setTextSize(35.0f);
    canvas.drawText(" (Find an approximation of pi) ", (getWidth()/2-360)+105,
(getHeight()/2-600)+130, paint);

    paint.setColor(Color. BLUE);
    paint.setTextSize(30.0f);
    canvas.drawText("Copyright(C) Sohun 2021.9.14", (getWidth()/2-360)+150,
(getHeight()/2-600)+1130, paint);

//----- 計算部始まり -----

    ct++;
    s = s + (double) 1 / ((2 * ct) * (2 * ct));

    pai = (double) Math.sqrt(24 * s);

//----- 計算部終わり -----

    paint.setColor(Color. BLACK);
    paint.setTextSize(40.0f);
    canvas.drawText("Number of terms = "+ct+"", (getWidth()/2-360)+40, (getHeight()/2-
600)+310+200, paint);

    canvas.drawText("Approximation of pi", (getWidth()/2-360)+40, (getHeight()/2-600)+590,
paint);
    canvas.drawText("= $\sqrt{24}(1/2^2+1/4^2+1/6^2+ \dots)$ ", (getWidth()/2-360)+50,
(getHeight()/2-600)+650-10, paint);

    canvas.drawLine((getWidth()/2-360)+112, (getHeight()/2-600)+610-1-10, (getWidth()/2-
360)+440+190, (getHeight()/2-600)+610-1-10 , paint);
    canvas.drawLine((getWidth()/2-360)+112, (getHeight()/2-600)+610-10, (getWidth()/2-
360)+440+190, (getHeight()/2-600)+610-10 , paint);
    canvas.drawLine((getWidth()/2-360)+112, (getHeight()/2-600)+610-10, (getWidth()/2-
360)+109, (getHeight()/2-600)+623-10 , paint);
    canvas.drawLine((getWidth()/2-360)+112-1, (getHeight()/2-600)+610-10, (getWidth()/2-

```

```

360)+109-1, (getHeight()/2-600)+623-10 , paint);
        canvas.drawLine((getWidth()/2-360)+112+1, (getHeight()/2-600)+610-10, (getWidth()/2-
360)+109+1, (getHeight()/2-600)+623-10 , paint);

        paint.setColor(Color.BLUE);
        canvas.drawText("=π ", (getWidth()/2-360)+50, (getHeight()/2-600)+690, paint);

        paint.setColor(Color.BLACK);
        canvas.drawText("Pi π", (getWidth()/2-360)+40, (getHeight()/2-600)+790, paint);
        canvas.drawText("=3.1415926535897932...", (getWidth()/2-360)+50, (getHeight()/2-
600)+840, paint);

        paint.setTextSize(30.0f);
        canvas.drawText("Touch the screen to activate.", (getWidth()/2-360)+50,
(getHeight()/2-600)+950, paint);
        canvas.drawText("Touch the screen again to stop the auto.", (getWidth()/2-360)+50,
(getHeight()/2-600)+990, paint);
        canvas.drawText("If you touch it further, it will be initialized.", (getWidth()/2-
360)+50, (getHeight()/2-600)+1030, paint);
        canvas.drawText("When the screen goes dark, touch the title bar !", (getWidth()/2-
360)+50, (getHeight()/2-600)+1070, paint);

        if (flag==1) { //flag=1 で自動になる    flag=2 で自動が止まる    flag=0 で初期化する
            invalidate(); //表示を更新する
        }

    } //protected void onDraw(Canvas canvas)

    @Override
    public boolean onTouchEvent(MotionEvent event) {
        flag++;
        flag = flag % 3;
        if (flag==0) {
            ct=0; //項数
            s=0; //πを求める過程で使用
        }
    }

```

```

        invalidate(); //表示を更新する
        return false;

    }//public boolean onTouchEvent(MotionEvent event)

} //public class MyPai9 extends View

[2]activity_main.xml
<?xml version="1.0" encoding="utf-8" ?>
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

    <TextView
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Hello World!"
        app:layout_constraintBottom_toBottomOf="parent"
        app:layout_constraintLeft_toLeftOf="parent"
        app:layout_constraintRight_toRightOf="parent"
        app:layout_constraintTop_toTopOf="parent" />

    <jp.kiyo.wuena.mykinjiofp9eng.MyKinjiofp9Eng
        android:id="@+id/myfview1"
        android:layout_height="match_parent"
        android:layout_width="match_parent"/>

</androidx.constraintlayout.widget.ConstraintLayout>

```

[3]MainActivity.java

/*

無限級数による π の近似9 (英語版)
Android 4.1 (Jelly Bean)
Copyright (C) K. Niwa 2021. 9. 14

*/

```
package jp.kiyo.wuena.mykinjiofp9eng;
```

```
import androidx.appcompat.app.AppCompatActivity;
```

```
import android.os.Bundle;
```

```
import android.util.DisplayMetrics; //<画像の拡大・縮小に必要なライブラリ>
```

```
import android.app.Activity;
```

```
import android.view.Menu;
```

```
public class MainActivity extends AppCompatActivity {
```

```
    static int ritsu;
```

```
    @Override
```

```
    protected void onCreate(Bundle savedInstanceState) {
```

```
        super.onCreate(savedInstanceState);
```

```
        setContentView(R.layout.activity_main);
```

```
        DisplayMetrics metrics = new DisplayMetrics(); //<端末の情報を取得する>
```

```
        getWindowManager().getDefaultDisplay().getMetrics(metrics);
```

```
        StringBuilder buffer = new StringBuilder();
```

```
        buffer.append("densityDpi (ドット数/インチ) : " + String.valueOf(metrics.densityDpi)  
+ "\n");
```

```
        ritsu=metrics.densityDpi;
```

```
    }
```

```
}
```