

# MATHEMATICS FORM 3

## PAPER 2 MARKING SCHEME

1. Numerator  
 $\frac{1}{2}$  of  $\frac{7}{2} + \frac{3}{2} \left( \frac{5}{2} - \frac{2}{3} \right)$

$$\frac{1}{2} \text{ of } \frac{7}{2} + \frac{3}{2} \left[ \frac{15-4}{6} \right]$$

$$\frac{1}{2} \times \frac{7}{2} + \frac{3}{2} \times \frac{11}{6}$$

$$\frac{7}{4} \times \frac{11}{4} = \frac{187}{4}$$

Denominator

$$\frac{3}{4} \times \frac{3}{2} \times \frac{2}{1} = \frac{15}{4}$$

$$= \frac{187}{4} \div \frac{15}{4}$$

$$= \frac{187}{4} \times \frac{4}{15} = \frac{187}{15}$$

$$= 1\frac{1}{15}$$

2.

NO

Log.

$$0.7841$$

$$\overline{1.8944}$$

$$0.1356\frac{1}{2}$$

$$\frac{\overline{1.1323}}{2} = \overline{1.5662}$$

$$\overline{1.4606}$$

$$\log 8492 = 1.929$$

$$0.2853$$

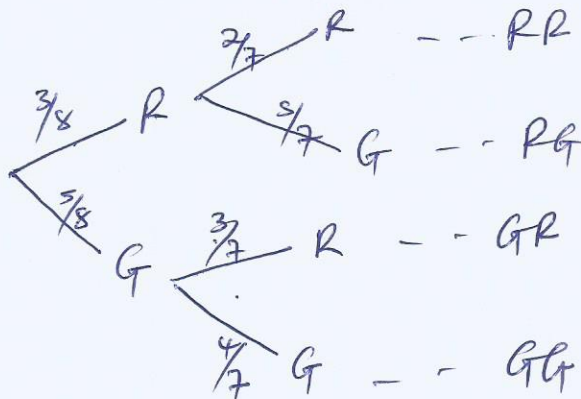
$$\overline{1.1753}$$

$$\frac{\overline{3.2.1753}}{3} = \frac{\overline{2.1753}}{3}$$

$$0.5310 \leftarrow$$

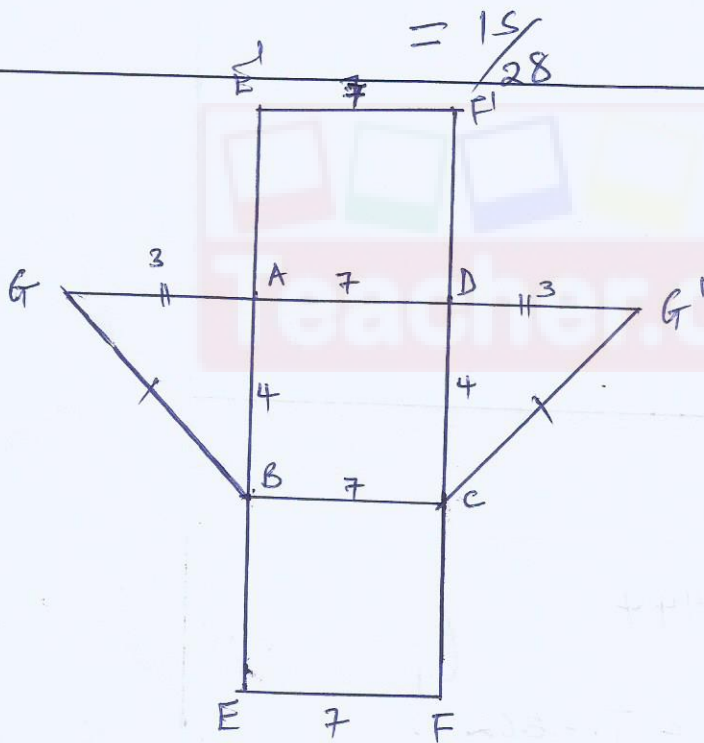
$$\overline{1.7251}$$

3.



$$\left(\frac{3}{8} \times \frac{5}{7}\right) + \left(\frac{5}{8} \times \frac{3}{7}\right) = \frac{15}{56} + \frac{15}{56} = \frac{30}{56}$$

4.



- ✓ IF  $EF = BC = AD$
- ✓  $EFGH$  and other sides of a rectangle
- ✓ Triangle must fit as one folds.
- ✓ Labelling of vertices
- ✓ Area of the shape =  $96 \text{ cm}^2$

$$5 \quad A^2 = \left( \sqrt{\frac{1-x}{1+x}} \right)^2$$

$$(1+x) \cdot A^2 = \frac{1-x}{(1+x)} (1+x)$$

$$A^2 + A^2x = 1-x$$

$$A^2x + x = 1 - A^2$$

$$\frac{x(A^2+1)}{A^2+1} = \frac{1-A^2}{A^2+1}$$

$$x = \frac{1-A^2}{A^2+1}$$

$$6 \quad \frac{3(2\sqrt{3} + \sqrt{2})}{2\sqrt{3} - \sqrt{2}(2\sqrt{3} + \sqrt{2})}$$

$$= \frac{6\sqrt{3} + 3\sqrt{2}}{4\sqrt{9} + 2\sqrt{6} - 2\sqrt{6} - \sqrt{4}}$$

$$= \frac{6\sqrt{3} + 3\sqrt{2}}{12 - 2}$$

$$= \frac{6\sqrt{3} + 3\sqrt{2}}{10}$$

$$\text{or } \frac{3}{5}\sqrt{3} + \frac{3}{10}\sqrt{2}$$



7 (a) Hire Purchase Price.

$$\begin{aligned} H.P &= (D + MI) \\ &= [200 + (250 \times 6)] \\ &= 200 + 1500 \\ &= \text{sh. } 1700 \end{aligned}$$

b) The extra amount paid.

$$\begin{aligned} &= 1700 - 1560 \\ &= \text{Ksh. } 140 \end{aligned}$$

8.  $\text{Log}(x+24) - \text{Log } 3^2 = \text{Log}(9-2x)$

$$\text{Log} \frac{x+24}{9} = \text{Log}(9-2x)$$

$$\cancel{9} \left( \frac{x+24}{\cancel{9}} \right) = (9-2x) \cancel{9}$$

$$x+24 = 81 - 18x$$

$$56 + 18x = 81 - 24,$$

$$\frac{19x}{19} = \frac{57}{19}$$

$$x = 3$$

$$9 \quad (1+2x)^8 = 1 + (8+2x) + 28(2x)^2 + 56(2x)^3 + \dots$$

$$1 + 16x + 112x + 448x$$

$$\Rightarrow (1+2x)^8 = (1.02)^8$$

$$\frac{2x}{2} = \frac{0.2}{2}$$

$$x = 0.01$$

$$= 1 + (16 \times 0.01) + 112(0.01)^2 + 448(0.01)^3$$

$$= 1 + 0.16 + 0.0112 + 0.000448$$

$$= 1.171648$$

$$= 1.172$$

$$10. \quad x^2 + 4x + y^2 - 10y = 7$$

$$x^2 + 4x + \left(\frac{4}{2}\right)^2 + y^2 - 10y + \left(\frac{-10}{2}\right)^2$$

$$= 7 + 2^2 + 5^2$$

$$(x+2)^2 + (y-5)^2 = 36$$

$$x = -2, \quad y = 5, \quad r = 6.$$

Centre  $(-2, 5)$

Radius = 6 units.

$$11 \quad x_1 = 2 \quad \text{and} \quad x_2 = -3$$

$$(x-2) \quad \text{and} \quad (x+3)$$

$$(x-2)(x+3)$$

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

$$x^2 + 3x - 2x - 6 = 0$$

$$x^2 + x - 6 = 0$$

M<sub>1</sub>

M<sub>2</sub>

A<sub>1</sub>

12 let  $x$  kg of maize flour to cost sh 40 and  $y$  kg of millet flour to cost sh 52. Then the cost of the mixture will be.

$$(x+y) \frac{40x + 52y}{x+y} = 46(x+y)$$

$$40x + 52y = 46x + 46y$$

$$52y - 46y = 46x - 40x$$

$$6y = 6x$$

$$1:1$$



13 In hours

$$A = \frac{1}{3}$$

$$B = \frac{1}{6}$$

$$C = \frac{1}{8}$$

$$\left( \frac{1}{3} + \frac{1}{6} - \frac{1}{8} \right) = \frac{3}{8}$$

$$\frac{1}{2} \div \frac{3}{8}$$

$$= \frac{1}{2} \times \frac{8}{3}$$

$$= 1\frac{1}{3} + 1$$

$$= 2\frac{1}{3} \text{ hrs}$$

14

10<sup>th</sup> term =  $ar^9$

8<sup>th</sup> term =  $ar^7$

$$\frac{ar^9}{ar^7} = 9$$

$$r^{(9-7)} = 9$$

$$\sqrt{r^2} = \sqrt{9}$$

$$r = \pm 3$$

$$r = 3 \quad \text{or} \quad -3$$

15

$$\frac{p^2 - 2pq + q^2}{p^3 - pq^2}$$

$$\frac{p^2 - pq - pq + q^2}{p(p^2 - q^2)}$$

$$\frac{p(p-q) - q(p-q)}{p(p+q)(p-q)}$$

$$\frac{(p-q)(p-q)}{p(p+q)(p-q)} = \frac{p-q}{p(p+q)}$$

m,

A

16

$$\begin{pmatrix} x & 1 \\ 4 & x-3 \end{pmatrix} \det = 0$$

$$x(x-3) - (1 \times 4) = 0$$

$$x^2 - 3x - 4 = 0$$

S = -3 No -4 and 1  
p = -4

~~x(x-4)~~

$$(x^2 - 4x) + (x - 4) = 0$$

$$x(x-4) + 1(x-4) = 0$$

$$(x+1)(x-4) = 0$$

$$x_1 = -1 \quad x_2 = -4$$

m,

m,

A



17 (a)  $x = 30 - (4+6+8+7+2)$

$x = 3$

(b) The modal class

(c) (i) the mean.

Mass kg	Mid-point	Frequency $f_i$	$f_i x_i$	C.F.
60-64	62	4	248	4
65-69	67	6	402	10
70-74	72	8	576	18
75-79	77	7	539	25
80-84	82	3	246	28
85-89	87	2	174	50

$\Sigma f = 30$      $\Sigma f x = 2185$

$\bar{x} = \frac{\Sigma f x}{\Sigma f} = \frac{2185}{30} = 72.83$

(ii) median.

$$L + \frac{(\frac{N}{2} - c.f.)}{f} i$$

$$69.5 + \frac{(\frac{30}{2} - 10)}{8} 5$$

$$= 72.63 \text{ kg}$$

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$$18 \text{ a) Length } AB \Rightarrow \cos 26 = \frac{y}{10}$$

$$y = 8.988$$

$$\cos 48.6 = \frac{x}{4}$$

$$x = 2.643$$

$$AB = 8.988 + 2.643 \\ = 11.633 \text{ cm.}$$

m,

m,

A,

b) Area of sector APQ

$$\frac{52}{360} \times 3.142 \times 10^2 \\ = 45.38 \text{ cm}^2$$

m,

A,

c) Area PAQ + PBQ

$$A = PAQ = \frac{1}{2} \sin 52 \times 10^2 \\ = 39.4 \text{ cm}^2$$

$$A = PBQ = \frac{1}{2} \sin 97.2 \times 4^2 \\ = 7.937$$

$$\text{Area} = 39.4 + 7.937$$

$$A = 47.34 \text{ cm}^2$$

m,

A,

$$d) (45.38 - 39.4) + \left( \frac{97.2 \times 3.142 \times 4^2}{360} - 7.937 \right)$$

$$= 5.98 + 5.636$$

$$A = 11.616 \text{ cm}^2$$

m,

m,

A,



19) (i)  $\angle SOQ = 2\angle SPQ = 106^\circ$   
 $360 - 106 = 254^\circ$   
 Angle at the centre subtended  
 by QS.

B,  
 B,

(ii)  $\angle OQS = \angle OSQ = \left(\frac{180^\circ - 106^\circ}{2}\right)$   
 $= 37^\circ$

B,  
 B,  
 B,

Base angle in an isosceles  $\Delta$

$\angle PSO = 180^\circ - (53^\circ + 30^\circ + 37^\circ + 37^\circ)$   
 $= 23^\circ$

(iii)  $\angle SRT = \angle SPQ = 53^\circ$   
 Exterior angle of a cyclic  
 quadrilateral

B,  
 B,

b) Area of OQPS

$\left(\frac{1}{2} \times 14^2 \sin 120\right) + \left(\frac{1}{2} \times 14^2 \sin 134\right)$   
 $(98 \sin 120) + (98 \sin 134)$

M,  
 M,  
 A,

$84.8705 + 70.4953$

$= 155.3658 \text{ cm}^2$



20)

$$(i) \quad \vec{PQ} = \vec{Q} - \vec{P}$$

$$(ii) \quad \vec{ON} = \frac{1}{3}\vec{P} + \frac{2}{3}\vec{Q}$$

$$(iii) \quad \vec{PT} = -\vec{P} + \frac{3}{5}\left(\frac{2}{3}\vec{Q} + \frac{1}{3}\vec{P}\right)$$

$$= \frac{2}{5}\vec{Q} - \frac{4}{5}\vec{P}$$

$$(iv) \quad \vec{PM} = -\vec{P} + \frac{1}{2}\vec{Q}$$

$$b) \quad k \left( \frac{2}{5}\vec{Q} - \frac{4}{5}\vec{P} \right) = -\vec{P} + \frac{1}{2}\vec{Q}$$

$$k = \frac{4}{5}$$

$$\vec{PT} = \frac{4}{5}\vec{PM}$$

$$\vec{PM} \parallel \vec{PT}$$

P is common.

Hence P, T and M are collinear.

B<sub>1</sub>M<sub>1</sub>  
A<sub>1</sub>M<sub>1</sub>A<sub>1</sub>M<sub>1</sub>  
A<sub>1</sub>B<sub>1</sub>B<sub>1</sub>B<sub>1</sub>

$$21 \text{ (a) } T = \frac{D}{S} = \frac{300 \text{ km}}{80 \text{ km/h.}}$$

$$= 3 \text{ hrs } 45 \text{ min}$$

$$+ \begin{array}{r} 7.00 \\ 3.45 \\ \hline 10.45 \text{ A.m.} \end{array}$$

M<sub>1</sub>

A<sub>1</sub>

b) The distance covered by the bus ~~before~~ before the car started the journey.

$$D = S \times T$$

$$= 80 \text{ km/h} \times \frac{3}{4} \text{ h.}$$

$$= 60 \text{ km.}$$

$$= 300 \text{ km} - 60 \text{ km}$$

$$= 240 \text{ km.}$$

$$S = \frac{D}{T}$$

$$T = \frac{D}{S} = \frac{240 \text{ km}}{200 \text{ km/h.}}$$

$$= \frac{6}{5} \text{ h.}$$

$$= 1 \text{ h } 12 \text{ minutes}$$

$$+ \begin{array}{r} 7.45 \\ 1.12 \\ \hline 8.57 \end{array}$$

M<sub>1</sub>

M<sub>1</sub>

A<sub>1</sub>

$$\begin{aligned}
 c) \quad D &= S \times T \\
 &= 80 \text{ km/h} \times 6 \frac{1}{5} \text{ h.} \\
 &= 96 \text{ km} + 60 \text{ km} \\
 &= 156 \text{ km}
 \end{aligned}$$

m,  
A,

or.

$$80 \text{ km/h} \times \frac{117}{60} = 156 \text{ km.}$$

d) The time the car takes from Eldoret to Nairobi

$$\begin{aligned}
 T &= \frac{D}{S} = \frac{300 \text{ km}}{120 \text{ km/h}} \\
 T &= \frac{5}{2} \text{ h.}
 \end{aligned}$$

m,  
m,

= 2 hrs - 30 minutes

$$\begin{aligned}
 D &= S \times T \\
 D &= 80 \text{ km/h} \times \frac{5}{2} \text{ h} \\
 &= 200 \text{ km.}
 \end{aligned}$$

The remaining distance

A,

$$\begin{aligned}
 &300 \text{ km} - 200 \text{ km} \\
 &= 100 \text{ km.}
 \end{aligned}$$



22 (i)  $P = k \frac{Q^2}{\sqrt{R}}$ ,  $k \rightarrow \text{Constant}$ .

$$k = \frac{P\sqrt{R}}{Q^2} = \frac{12 \times \sqrt{36}}{24^2} = \frac{1}{8}$$

Hence  $P = \frac{1}{8} \frac{Q^2}{\sqrt{R}}$

when  $Q = 27$ ,  $R = 121$

$$P = \frac{1}{8} \times \frac{27^2}{\sqrt{121}} = \frac{729}{88}$$

$$P = 8.2841$$

M<sub>1</sub>

M<sub>1</sub>

A<sub>1</sub>

(ii)  $Q_1 = 1.21 Q^2$

$$R_1 = 0.866025403 \sqrt{R}$$

$$P_1 = k \times \frac{1.21 Q^2}{\sqrt{0.75R}} = 1.3971876 \frac{kQ^2}{\sqrt{R}}$$

New change:  $\left( \frac{(1.3971876 - 1) \frac{kQ^2}{\sqrt{R}}}{\frac{kQ^2}{\sqrt{R}}} \right) 100\%$

$$= 39.71876\%$$

Hence P increased by

$$39.72\%$$

M<sub>1</sub>

M<sub>1</sub>

M<sub>1</sub>

A<sub>1</sub>

$$(iii) Q = k \frac{1}{\sqrt{P}}$$

$$k = Q \sqrt{P}$$

$$= 3 \sqrt{4}$$

$$= 6$$

$$Q = 6 \frac{1}{\sqrt{P}}$$

$$P = \left( k \frac{1}{Q} \right)^2$$

$$= \left( 6 \times \frac{1}{8} \right)^2 = \left( \frac{6}{8} \right)^2$$

$$\frac{9}{16}$$

$m_1$

$m_1$

A<sub>1</sub>

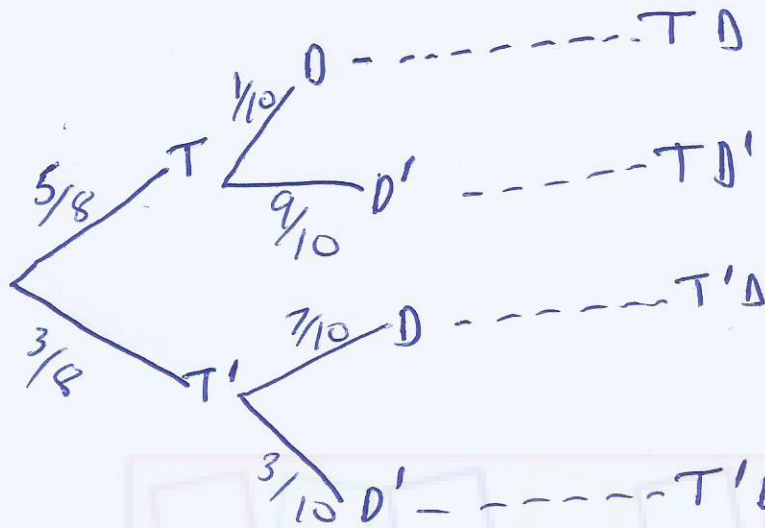
23 (a) (i)  $P(T) = \frac{30}{48} = \frac{5}{8}$

B<sub>1</sub>

(ii)  $P(T') = \frac{18}{48} = \frac{3}{8}$

B<sub>1</sub>

b)



(i)

$P(TD) = \frac{5}{8} \times \frac{1}{10}$   
 $= \frac{1}{16}$

M<sub>1</sub>

A<sub>1</sub>

(ii)

$P(T'D) = \frac{5}{8} \times \frac{7}{10}$   
 $= \frac{21}{80}$

M<sub>1</sub>

A<sub>1</sub>

(iii)

$P(TD') = \frac{5}{8} \times \frac{9}{10}$   
 $= \frac{9}{16}$

M<sub>1</sub>

A<sub>1</sub>

(iv)

$P(T'D') = \frac{3}{8} \times \frac{3}{10}$   
 $= \frac{9}{80}$

M<sub>1</sub>

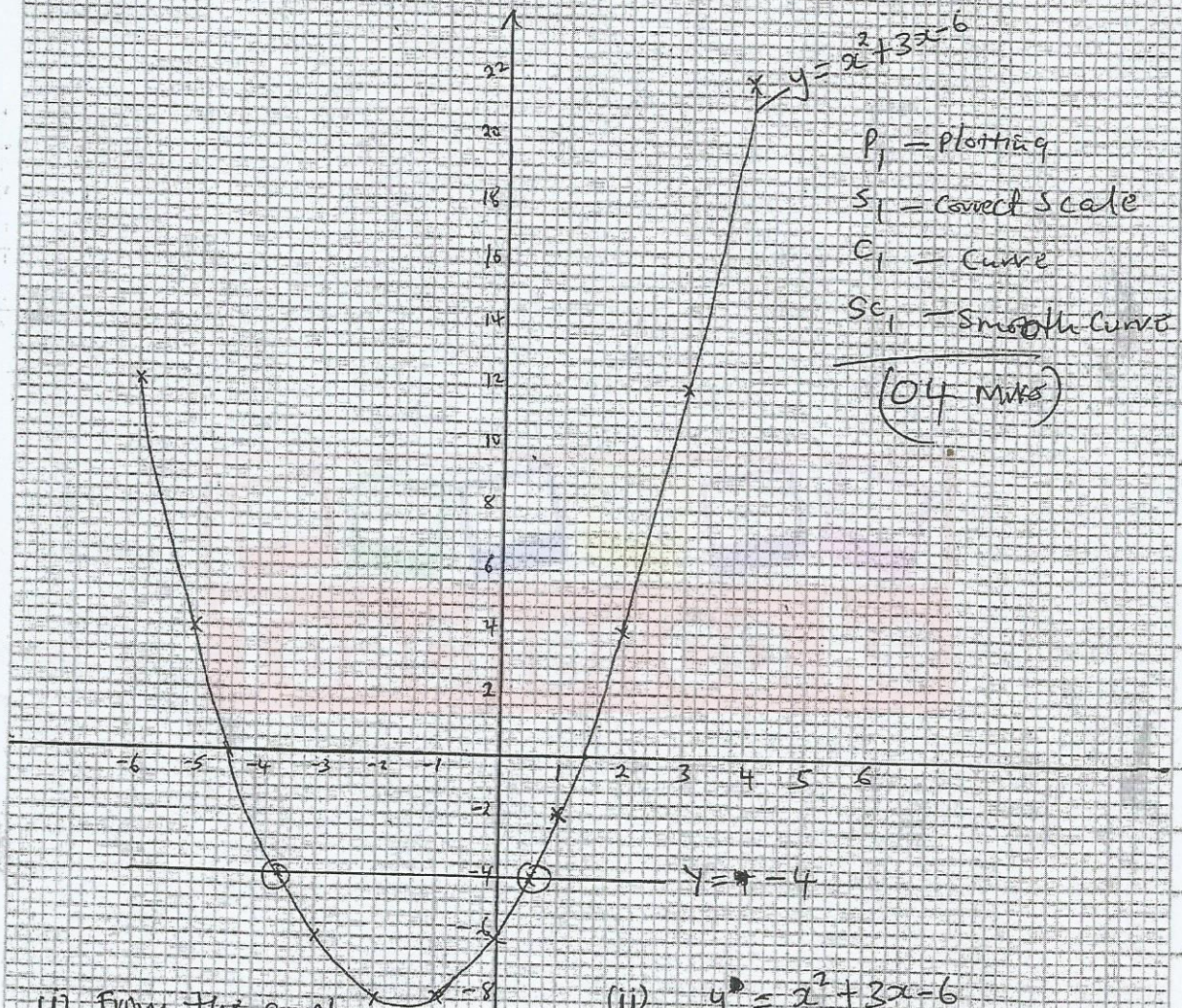
A<sub>1</sub>



24)

2018/9

X	-6	-5	-4	-3	-2	-1	0	1	2	3	4
Y		4	-2		-8	-8		-2	4	12	



(i) From the graph.  
 $x = -4.4$  or  $x = -1.4 \pm 0.5$   
 The points (circles) should be clearly on the graph.

(ii)  $y = x^2 + 3x - 6$   
 $0 = x^2 + 3x - 2$   
 When  $y = -4$   
 $x = -3.6$  or  $0.6 \pm 0.5$

R  
A  
T  
I  
O  
P