

MATHS PAPER 1 YEAR 2010

SOLUTION	MARK	COMMENTS
1. $\frac{-2(5+3) - 9 \div 3 + 5}{-3 \times -5 \times (-2) \times 4} = -\frac{14}{7}$ $= -2$ seen	B1 B1 B1 3	Numerator Denominator Ensure workings are
2. Total fractions: $\frac{3}{8} + \frac{2}{5} = \frac{31}{40}$ Remaining fraction $= 1 - \frac{31}{40}$ $= \frac{9}{40}$ B1 Original amount $= \text{Sh } 12330 \times \frac{40}{9}$ $= \text{sh } 54,800$ Tatu's fees $= \text{sh } \frac{2}{5} \times 54800$ $= \text{sh } 21,920$	M1 M1 A1	Alt: 0.2 Remaining $= \frac{31}{40}$ Tatu: Rem $= \frac{2}{5} : \frac{9}{40}$ $= 16.9$ $\therefore \frac{16}{9} = \frac{T}{12330}$ 9 $4 = 21920$
3. Gradient (1 or) $= -\frac{1}{2}$ After good $= -\frac{1}{2} \text{ mk}$ sunst in equ $y + 2 = -1$ $x - 3 \geq 2$ $y = -\frac{1}{2}x - \frac{1}{2}$ $-\frac{1}{2} = c$ $y = -\frac{1}{2}x - \frac{1}{2}$ A1	B1 M1 A1 3	Alt 1 $-2 = -\frac{1}{2}x + c$ M1 $-2 = -\frac{3}{2} + c$
4. Let the distance be d km $\frac{d}{75}$ and $\frac{d}{95}$ 20km/h $\therefore \text{Time taken} = \frac{25}{20} = 1\frac{1}{4} \text{ hr}$ $\therefore \frac{d}{75} - \frac{d}{95} = \frac{20}{60}$ M1 $= 118.75$ $d = 118.75 \text{ km}$ M1	M1 M1 A1 A1	Accept equivalents Alt 1: Rel spded = $\text{Equation} \therefore \text{dist} = 1\frac{1}{4} \times 95$ $\text{Alt 2 } \frac{x+25}{x} = \frac{45}{75}$
5. Let odd integers to: $x, (x+2), (x+2+2)$ $x + (x+2) + (x+2+2) > 219$ $3x > 213$ $x > 71$	M1 A1	



Teh numbers are 73, 75, 77

B1 3

6. a) sh $77.24 \times 100,000$
 $= sh 7,724,00$

M1

A1

b) Sh $77.24 \times 100,000$
 122.27
 $= 63172$

M1

A1 4

7.

$$\begin{aligned} RQ &= r + p + \frac{1}{2}r \\ &= p - \frac{2}{3}r \\ OM &= r + \frac{1}{2}(p - \frac{2}{3}r) \\ &= \frac{2}{3}r + \frac{1}{2}p \end{aligned}$$

1

M1

A1 3

8. $27\frac{3}{2} \times (8\frac{1}{16})^{-\frac{1}{4}} = (3^3)^{\frac{1}{2}} \times (3^4\frac{1}{24})^{-\frac{1}{4}}$
 $= 3^2 \times (3^{\frac{1}{2}})^{-1}$
 $= 3^2 \times 3^{\frac{1}{2}}$
 $= 6$

M1

M1

9. Total No of seedlings
 $= (5 \times 1) + (10 \times 3) + (5 \times 1) + (20 \times 4)$
 $+ (30 \times 1) + (01 \times 2)$
 $= 5 + 30 + 15 + 80 + 30 + 20 = 180$
% of height (h) : $23 < h < 27$
 $= (30 + 15) \times 100$
 180
 $= 255$

Accept

M1 $1sq = 5$ seedlings
 $\therefore 36sq = 5 \times 36 = 180$
R 180 can alone
M1 ALT: $9/36 \times 100\% M1$

A1 3 $= 25\% A1$

10. a)
500
 $= sh. 1800,000$
Commission = $sh(180,000 - 100,000) \times 2/100$
 $= sh 1600$
Total earnings = $sh(12000 + 1600)$
 $= 13600$
i) New salary = $sh(12000 + 12000 \times 10/100)$
 $= sh 13,200$
Commission paid = $sh(17,600 - 13,200)$
 $= sh 4,400$
Commissionis paid on sh $4400 \times \frac{100}{2}$
 $= 220,000$
Ttoal sales = $sh. 220,000 + 100,000$
 $= 320,000$
ii) No of handbags sold = 320,000

Ttoal sales = sh 360 x

M1

M1

A1

M1

M1

M1

A1

B1

M1



12.	$x^2 + x - 4xy - 4y - x(x + 1)$ $(x + 1)(4y^2 - xy) (x + 1)(y)(4y - x)$ denominator $= (x - 4y)(x + 1)$ numerator $(x + 1)(-y)(x - 4y)$ $=^{-1}/_y$	M1	factorization of
		M1	factorization of
		A1 3	accept $^{-1}/_y ; ^1/_{-y}$
13.	$\sin 3\Theta = \cos 2\Theta$ $\sin 3\Theta = \sin (90^\circ - 20)$ $3\Theta = 90^\circ - 20$ $\therefore 5\Theta = 90$ $\Theta = 18^\circ$ If $3\Theta = 90 - 2\Theta$	M1	or $\cos (90^\circ - 3\Theta) = \cos 90 - 3\Theta = 26$ $90 = 5\Theta$ $180 = \Theta$
		A1	
		3	$\Theta = 18$
14.	$2\pi r^2 + 2\pi rh = 154$ $r = h$ $2\pi r^3 + 2\pi r^2 = 154$ $4\pi r^2 = 154$ $r = ^{154}/_4 \times 3.142$ $= 3.500$ diameter = $2\pi = 3.500 \times 2$ $= 7.00$ (s dp)	M1	Accept P = $^{22}/_7$
		M1	
		A1	3
15.	Accept $2/3 = 0.666$)re-use of decimals Apply Pa- if not 4 sig figs		
	Let OC = r		
	$\therefore CD = ^2/_3 r$ and $EF = ^2/_3 (r + s)$ $^2/_3 r + ^2/_3 (r + s) + 5 + 5 = 24$ $^4/_3 r = 10^{2}/_3$	M1	or Equivalent
a)	Internal volume of = $150 \times 80 \times 40 \text{cm}^3$ $= 480,000 \text{cm}^3 = 0.48 \text{m}^3$ External vol = $152 \times 82 \times 42 \text{cm}^3$ $= 523488 \text{cm}^3$ Volume - $480,000 \text{cm}^3$	M1	$1.5 \times 0.8 \times 0.4$
		A1	Equivalent
	ii) Mose of box = 188×0.6 $= 26.0928 \text{kg}$ $= 26.1 \text{ kg}$	M1	b (i)
	b) i) No of tins = $^{150}/_{10} \times ^{80}/_{10} \times ^{40}/_{20}$ $= 240$ $^{40}/_{10} + ^{80}/_{10} \times ^{40}/_{20}$	M1	$224 + 16 = 29$
	ii) total mass = $26.1 + 240 \times 200$)	A1	or equivalents
		M1 10	b) i) $^{140}/_{20} \times ^{80}/_{10} \times$ $= 224 + 16 = 240$

$= 54.9\text{kg}$	A1	or 54892.8g
17. a) $\text{Det } /45 - 42/ = 3$	B1	
Inverse $A^{-1} = 1/2(9 -6)$	B1	19. b (ii) $X = 1 (9$
$-6)$		
$3 -7 5$	B1	$y 3 -7 5$
b) i) $5 \ 6 \ x = 2 \ 4 \ 4 \ 0$	B1	$= 1/_{2 \ 600}$
$7 \ 9 \ y \ 3 \ 5 \ 6 \ 0$	720	
ii) $3 \ -2 \ 5 \ 6 \ x = 3 \ -2 \ 2440$	M1	$= \frac{200}{240}$
$-7 \ 5 \ 7 \ 9 \ y \ -7 \ 53560$		
3		
$1 \ 0 = 3x 2440 - 2x 3560$)	M1	$x = 200, y = 240$
A1		
$0 \ 1 \ y - \frac{7}{3} x 2440 + \frac{5}{3} x 3560$)		
$x = 200$		
$y = 240$		
$\therefore x = 200; y = 240$	A1	Ttotal discount
Total cost of books = $(36x 200) + (50x 240)$	A1	$\frac{5}{100} x 200 x 36 +$
$\frac{8}{100} x 240 x 50$ N1		
$= 19200$	M1	$= 1320$
Ttola cost with discount		
$= \underline{36x 200 x 95} + \underline{50 \ 20 x 40 x 92}$	M1	$\underline{1320} x 100\% -$
m1		
$10 \ 100$		19200
% discount = $\underline{19200 - 17880} x 100$	M1	If 19 (b) lost
because of not getting	19200	
matrix but gets $x = 200$ and $y = 240$		
19. b) ii) Use of determinants		
$x = -y = 1 \ P \ 2440 \ 6$		
$1 \ 2 \ 3 \ 3560 \ 9$		
$5p + 6m ? 2440 = 0$	5 6	
$7p + 9m - 3560 = 0$	7 9 = 2	
$1 = 6 - 2440$	5 2440	
$9 - 3560$	7	$3560 = 24$
$2 = 5 - 2440 \ 5 \ 6$		
$7 - 3560 \ 7 \ 9$		
$3 = 5 \ 6$		
7	9	
Crammers rule		
$5 \ 6 \ p = 2440$		
$7 \ 9 \ m \ 3560$		
20.b) i) Distance of P from s = $10.8 + 0.1\text{cm}$	B1	
ii) $\angle \text{PSN} = 74 + 10$	B1	
earing of P from S = $286 + 10$	B1	

c) area of PQR = $\frac{1}{2} \times 10.2 \times 12.2$
 $= 63.44 \text{ km}^2$

Area of ranch PQRS
cm
 $= 62.22 + 30.6$
 $= 92.82 \text{ km}^2$

A1 10

21. a) i) a takes $\frac{180}{x+10}$ B1 i) $\frac{180}{x-10} - \frac{180}{x+10} = \frac{3}{2}$
ii) b takes $\frac{180}{x}$ B1 ii) $\frac{180}{x}$ B.O

$$180(x+10) - 180x = 3.2$$

$$180(x+10) - 1890x = \frac{3}{2}x(x+10)$$

$$360x + 3600 - 360x = 3x^2 + 30x$$

$$x^2 + 10x - 1200 = 0$$

$$M1 \quad \text{or Equivalent}$$

$$360x + 3600 - 360x = 3x^2 + 30x$$

$$x^2 + 10x - 1200 = 0$$

$$M1 \quad \text{for quadratic equation}$$

$$9x - 30)(x + 40) = 0$$

$$(x - 30)(x + 40) = 0$$

$$M1$$

$$x = 30 \text{ or } x = 40$$

$$A1$$

$$\text{Speed of A} = 30 + 10 = 40$$

$$B1$$

$$c) \text{Time taken by A} = \frac{48}{40} \times 60 = 72 \text{ min}$$

$$M1 \quad \text{for A or B}$$

$$\text{Time taken by B} = \frac{48}{40} \times 60 = 96 \text{ min}$$

$$\text{diff. in time } 86 - 72 = 14 \text{ min}$$

22. a) i) Reflection in the line PR or Er B1
 ii) Enlargement centre E B1
 Scale fatcor -1 B1
 iii) Rotation about pt R B1
 Through 900
 clockwise B2 Accept -90 or 270
 b) i) R - S B1 - quarter tum B2
 C - A B1 + quarter turn 32
 ii) R - Q B1
 C - E B1 10

23. a) Modal frequency = 8		B1	
NMo of kg	Freq.	mid pts	Fx
atleast			Cf
of meat	(f)	(x)	M1
1 - 5	2	3	for x for
6 - 10	3	8	24
11 - 15	6	13	78
16-20	8	18	144
C.A.O silent			A1
21-25	3	23	22
26-30	2	28	56
			24



31 - 35 33 33 25 Note: allow a maximum of two entries to be wrong for m/s

$$25 \quad 410$$

$$\text{ef} \quad \text{efx}$$

$$\text{Mean} = \frac{410}{25} \quad \text{M1} \quad \text{Lc} + \text{fcf}$$

f

$$= 16.4 \quad \text{A1} \quad 15.5 + 12.5 - 11) \times 5$$

8

$$= 16.4375$$

$$\text{c) } 2,5,11,19,22,24,25$$

B1 seen or implied

$$\text{Median} = 15.5 + \frac{2}{8} \times 5$$

B1 Medium class identified and

15.5 use din the formula

$$= 16.75$$

A1

24. a) i) Area of base x^2

B1

or area of sides = $4xh$

M1

$$x^2 + 4xh = 432$$

A1

$$h = 432 - x^2$$

$$4x$$

$$\text{ii) Volume} = x^2h$$

B1

$$= x^2(432 - x^2)$$

$$4x$$

$$\text{b) i) Volume (v)} = 108x - \frac{1}{4}x^3$$

B1

$$\frac{dv}{dx} = 108 - \frac{3}{4}x^2$$

M1

$$108 - \frac{3}{4}x^2 = 0$$

M1

$$x = 12$$

A1

$$\text{ii) Vol} = 108x - \frac{1}{4}x^3$$

M1

$$(108x 12) - \frac{1}{4}x 12^3$$

A1 10

$$= 864\text{cm}^3$$



MATHS PAPER 2

1.
$$\frac{(7.55 \times 5.25) - (7.45 \times 5.15)}{2 \times 7.5 \times 5.2} \times 100$$

$$= 1.628\%$$
M1
M1
A1 3
difference

2.
$$\begin{aligned} & \frac{4}{5+2} - \frac{3}{5-2} \\ & = \frac{4(5-2) - 3(5+2)}{(5+2)(5-2)} \\ & = \frac{4/5 - 3/3}{3/5 - 3/2} \\ & \quad \text{rational denominator} \\ & = \frac{5-3}{3} \\ & = \frac{5-7/2}{3} \end{aligned}$$
M1
Expansion with
A1 3

3.
$$\begin{aligned} & \angle PCT = 36^\circ \\ & \angle OTC = 36^\circ \\ & \angle CTB = 90^\circ - 36^\circ = 54^\circ \\ & \text{which you use } 340^\circ \\ & \text{or } \frac{1080^\circ}{2} = 54^\circ \end{aligned}$$
B1
B1
B1
3
awards marks

4. Let active x to y or $x + y = 35$

$$\begin{aligned} & 68x + 53y = 62 \\ & 62 - 53 \\ & \quad x + y \\ & 6x = 9y \\ & x:y = 9:6 \\ & \quad = 3:2 \end{aligned}$$
M1
diff: 68 - 62 and
6
9
Alt. x y
68 53
62 6
9 6
2
ration = 9:6 = 3:2

5. Length = $2x$

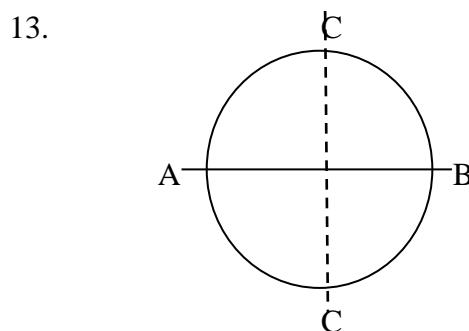
$$\begin{aligned} & \text{Area} = 2x - 2x = 60 \\ & x - x = 30 = 0 \\ & (x - 6)(x + 5) = 0 \\ & x = 6 \\ & \therefore \text{length} = 2 \times 6 - 2 = 10\text{cm} \end{aligned}$$
M1
M1
A1 3

6. One person cut build $\frac{1}{5}x$ huts in 21 days

$$\begin{aligned} & \text{People can build 6 huts in 21 days} \\ & 2 \text{ people and builds in 15 days} \\ & 21 \times \frac{6}{3} \times \frac{21}{15} \\ & = 14 \text{ people} \end{aligned}$$
M1
A1 2



$$\begin{aligned}
 7. \quad R &= 3800 \times 100 & M1 \\
 &\quad 4000 \times 5 \\
 &= 1.9\% \\
 3420 &= \frac{P \times 1.4 \times 7.5}{100} & M1 \\
 P &= 3420 \times 100 \\
 &1.98 \\
 &= 24\,000 & A1 3
 \end{aligned}$$



- | | |
|---|---------|
| a) Locus of P drawn | B1 |
| b) 1 bisector of AB constructed | B1 |
| Positions of C indicated in
two places | B1
3 |

$$\begin{aligned}
 14. \quad 3y - y &= \frac{p}{q} + \frac{1}{x} & M1 & \text{removal of accept} \\
 2y(q + \frac{1}{x}) &= p \\
 q + \frac{1}{x} &= \frac{p}{2y} \\
 \frac{1}{x} &= \frac{p}{2y} - q & M1 & \text{for collecting the} \\
 \text{in } x \\
 x &= \frac{2y}{p-2yq} \text{ or } -\frac{2y}{2qy-p} & A1 & \text{a lost of wac not} \\
 \text{simple}
 \end{aligned}$$

$$\begin{aligned}
 15. \quad \log(\frac{\log x}{10}) &= \log(3x - 2) & M1 & \text{for single logo} \\
 \frac{15 - 5x}{10} &= 3x - 2 & M1 & \text{for dropping los} \\
 15 - 5x &= 30x - 20 \\
 x = 1
 \end{aligned}$$

A1 3

- | | |
|--------------------------------------|----|
| 16. a) Co-ordinates of centre (1, 1) | B1 |
| ii) radius $r^2 = 1^2 + 3^2 = 10$ | |
| $r = 3.16^2$ or $f = 10$ | B1 |
| accept t | |
| b) equation | |



$(x - 1)^2 + (y + 1)^2 = 10$ $(100)^2$ centre must within the circle) $x^2 - 2x + 1 + y^2 + 2y + 1 = 10$ $x^2 + y^2 - 2x + 2y = 8$	M1 A1 4	Give even for allow use of 3.16
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17.

c) i) $\sin x^\circ - \cos x^\circ = 1.2$ $x^\circ = 103 + 10, 16.7 + 1$ ii) $\cos x^\circ = \frac{1}{2} \sin x^\circ$ $= 63^\circ + 1^\circ$ iii) $\cos 63^\circ = 0.45 + 0.01$	B1 B1 B1 B1 10	for both co,e from graph
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18. a) $OB = 3p + 3r$ $AT = 2p - 2r$

B1

B1

b) $OX = m(OB) = n(3p + 3r)$ $3mp + 3mr$ ii) $OX = 2r + p + n(2p - 2r)$ $= (1 + 2n)p + (2 - 2n)r$ ii) $m(3p + 3r) = 2r - 2nr + p + 2np$ $3mp + 3mr = r(2 - 2n) + p(1 + 2n)$ $3m = 1 + 2n.....i)$ $3m = 2 - 2n.... (ii)$

M1

equating coeff

1 + 2n = 2 - 2n

eqns

 $4n = 1 = n = \frac{1}{4}$ subst/ for $n = \frac{1}{4}$ in 9i) $3m = 1 + 2 \times \frac{1}{4}$ $3m = 1\frac{1}{2} = n = \frac{3}{2r3} = \frac{1}{2}$

The ration in which x divides AJ

 $AX = nAJ = \frac{1}{4}AJ$

Ration 1:3

A1

solving the two

B1

It her ms above

19. Angle subtended (longitude)

 $16 + 24 = 40^\circ$ i) $\text{Arc AB} = 60 \times 40 \times \cos 34^\circ$ $= 1989.69 = 1990 \text{ nm}$

B1

M1

A1

ii) Arc AC: latitude difference

 $= 26 + 34 = 60^\circ$ $\therefore \text{Arc AC} = 60 \times 60 \text{ nm}$ $= 360^\circ$

B1

B1



b) i) real time at B

$$1330 + \frac{40}{15}h$$

M1

$$1330 + 2h\ 40\text{min}$$

$$= 1610\text{h}$$

A1

ii) Time taken to travel from A to B

$$= \frac{1990}{40}$$

M1

$$= 49\text{h } 45\text{min}$$

Time of arrival

Wednesday at $1610 + 1\text{h } 45\text{ min}$

M1

allow emmisison

of Wednesday

$= \text{Wed at } 1755\text{h}$

A1 10

20. a) $Ax + 6y > 144$

B1

$$100x + 200y = 4800$$

B1

$$x > 16$$

$$y > 10$$

B1

for both

b)

21 a) let number of rows be r and
number of persons per row be p

$$pr = 600$$

M1

$$(r + 5)(p - 6) = 600$$

M1

$$(r + 5)(\frac{600}{r} - 6) = 600$$

M1 or equivalent

$$(r + 5)(600 - 6r) = 600r$$

M1 for quadractic

equatn expanded

$$r^2 + 5r - 500 = 0$$

M1

attempting to

$$(r + 25)(r - 20) = 0$$

solve quadractic eqn

$$r = 20$$

A1

b) No.of rows in
new arrangement

$$20 + 5 = 25$$

B1

$(\frac{600}{25}, \frac{450}{25})$

No. of empty spaces per row with
450 pupils seated

$$600 - 450$$

M1

or equivalent

$$\frac{150}{25}$$

M1

$$= 6$$

A1 10

22. a) $T_6 = p + 5c$

$$T_5 = p + 4d$$

B1

$$p + 4d = p + 5c$$

M1



$4d = 5c$	A1	
$d = \frac{5}{4}c$		
b) $p + 3d - (p + 3c) = 1\frac{1}{2}$	M1	
$3d - 3c = 1\frac{1}{2}$		
$\frac{15}{4}c - 3c = 1\frac{1}{2}$		
$\frac{3}{4}c = \frac{3}{2} = c = 2$	A1	
$d = 2\frac{1}{2}$	B1	accept $\frac{5}{2}$
c) $S_5 = \frac{1}{2}(24 + 5 \times 2)$	M1	
$S_5 = \frac{1}{2}n(2p + 10) = 2.5(2p + 10)$		
$= 5p + 25$		
$(6p + 30) - (5p + 25) = 10$	M1	
$p + 5 = 10$		
$p = 5$	A1	
23. a) $S = at + bt^2$	B1	May be applied either of the
$80 = 2a + 4b \dots \text{(i)}$	M1	
equations		
$135 = 3a + 9b \dots \text{(i)}$		
ii) $x^2 = 270 = 6a + 18b$	M1	attempt to solve simultaneous
i) $x^3 = 240 = 62 + 12b$		
$30 = 6b = b = 5$		
substitution for $b = 5$ in (i)		
$80 = 2b + 4 \times 5$		
$60 = 2n = a = 30$	A1	for both a and b
Expression: $S = 30t + 5^2$	B1	A above is lost
b) i) distance when $t = 5$ seconds		
$S = 30 \times 5 + 5 \times 25$	M1	
$= 275\text{m}$	A1	A above is lost
ii) $560 = 30t + 5t^2$		
$5t^2 + 30t - 560 = 0$	M1	
$t + 6t - 112 = 0$		
$(t + 14)(t - 8) = 0$	M1	attempt to solve
quadraic equation		
time taken, $t = 8$ seconds	A1 10	
24. a) i) $\angle OSR = 90 - 50 = 40$	B1	or $SOR = 10^\circ C$
$\therefore ORS = 40$	B1	
ii) $\angle USP = 30 + 50^\circ = 80^\circ$	B1	follow through
iii) $\angle PSR = 30^\circ$	B1	do not accept
iii) $\angle PQR = 180^\circ - 50^\circ = 130^\circ$	B1	accept of one



b) i) $PT \times TR = TS^2$ $(TX) (7) = 9^2$ $7x = 81 - 49 = 32$ $x = \frac{32}{7} = 4.57$	M1	or equivalent
ii) $4.57 = 2r$ $\sin 30$ $r = 4.57$	M1	making the r_v 8
$2\sin 30$ A1 $m_1 \cos 40^\circ$	A1	

