NTIMA, NYAKI AND MUNICIPALITY CLUSTER EVALUATION - 2016

Kenya Certificate of Secondary Education

MATHEMATICS

Paper - 121/1

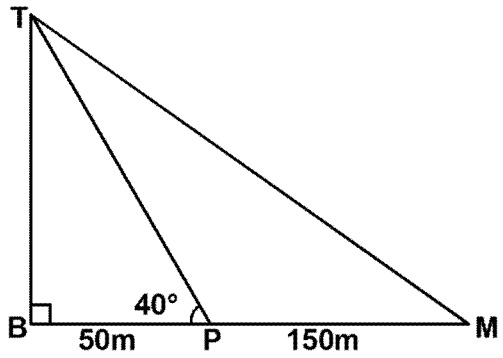
July/August 2016

Marking Scheme

	ANSWERS	MARKS	REMARKS
1.	$Num: \frac{1}{2}\times 18 \div -3 + \left(\frac{5}{2}\times\frac{3}{5}\right)$		
	$= 9 \div -3 + -\frac{3}{2}$		
	$= -3 - \frac{3}{2}$	M1	
	$= -\frac{9}{2}$		
	$Den := \frac{1}{2} + \left(\frac{15}{4}\times\frac{4}{3}\right)$		
	$= 5\frac{1}{2}$	M1	
	$\therefore -\frac{9}{2}\times\frac{2}{11}$		
	$= -\frac{9}{11}$	A1	
		3	
2.	Let the interior angle be x		
	Exterior angle $= {}^{1}/_{3}\,x$		
	$x + \frac{1}{3}x = 180$	M1	
	$\frac{4}{3}x = 180$		
	$x = \frac{180\times 3}{4}$		
	$= 135$	A1	
	$Exterior \;\; = \frac{1}{3}\times 135 = 45°$	B1	B1 is tied to A1
		3	
3.	$n = \frac{360}{45} = 8 sides$		
	$\frac{x+2y}{3} - \frac{3x-y}{5}$	M1	
	$= \frac{5(x+2y)-3(3x-y)}{15}$	M1	
	$= \frac{5x+10y-9x+3y}{15}$	A1	
	$= \frac{-4x+13y}{15}$	3	
4.	7000 x 100/80 = shs 705,600	M1	
	705,600 - 332,790 = shs 372810	M1	

ANSWERS	MARKS	REMARKS
$= \frac{372{,}810}{146.20}$		
=£ 2550	A1 3	
5. No of overtime hours = x No. of normal hours = y		
$x + y = 81$ $15x + 12y = 1071$	M1	for the formation of the two equations
$(x + y = 81)\ 4$ $(5x + 4y = 357)\ 1$		
$5x + 4y = 357$ $4x + 4y = 324$ $x = 33$ $y = 81 - 33$	M1	attempt to eliminate one
$y = 48$	B1 4	
6. $2x - 1 < 7 + x$ $x < 8$	B1	
$7 + x \leq 3x + 2$ $-2x \leq -5$		
$x \geq 2.5$	B1	
I.V 3, 4, 5, 6, 7	B1 3	
7. Vol of the sphere		
	M1	
= 381.753		
Mass = density × volume 8.9×381.753 $= 3397.6017$	M1	
$\frac{4}{3} \times 3.142 \times 4.5^3$	A1 3	
8.	M1 M1 A1 3	Numerator Denominator
9.		

	ANSWERS	MARKS	REMARKS
	$\frac{(2x-y)(x-2y)}{(x-2y)(x+2y)}$	B1	for M_2
	$=\frac{2x-y}{x+2y}$	M1	
		A1	or equivalent
		3	
10.	$M_1 = \frac{3}{2}$		
	$M_2 = -\frac{2}{3}$	M1	
	$\frac{y+\frac{1}{3}}{x-3} = \frac{-2}{3}$		
	$3y+1 = -2x+6$		
	$3y = -2x+5$	M1	
11.	$27^{y} + 3^{3y} = 54$	A1	
	$3^{3y} + 3^{3y} = 54$	3	
	$2\left(3^{3y}\right) = 54$		
	$3^{3y} = 27$		
	$3^{3y} = 3^{3}$		
	$3y = 3$	M1	
	$y = 1$		
		M1	
12.	$\frac{2y^2}{2} - \frac{7}{2}y + \frac{6}{2} = \frac{0}{2}$		
	$y^2 - \frac{7}{2}y + 3 = 0$	A1	
	$y^2 - \frac{7}{2}y + \frac{49}{16} = -3 + \frac{49}{16}$	3	
	$\sqrt{\left(y-\frac{7}{4}\right)^2} = \pm\sqrt{\frac{1}{16}}$	M1	
	$y - \frac{7}{4} = \pm\frac{1}{4}$		
	$y = \frac{1}{4} + \frac{7}{4}$ OR $y = -\frac{1}{4} + \frac{7}{4}$	M1	
	$y = 2$ OR $y = 1\frac{1}{2}$		
	Area of a sector	M1	

ANSWERS	MARKS	REMARKS
$2.2 = \frac{60}{360} \times \frac{22}{7} \times D$ Area of segment 2.31 - 1.91 $D = \frac{2.2 \times 360 \times 7}{60 \times 22}$ = 0.4m² **13.** $D = 4.2$	A1 4	
$= \frac{60}{360} \times \frac{22}{7} \times 2.1^2$ $= 2.31m^2$ $= \frac{1}{2} \times 2.1^2 Sin60$ $= 1.91m^2$		
Tan 40° = $\frac{TB}{50}$	M1	
~~TB = 50 Tan 40~~ = 41.95 m		
Tan TMP = $\frac{41.95}{200}$	M1	
= 0.2098 ∠TMP = 11.85°	A1 3	
14. 	M1 A1 B1 3	
15. Mean = $\frac{84}{12}$		
$\begin{pmatrix} x-1 \\ 2-y \end{pmatrix} + \begin{pmatrix} 4 \\ 6 \end{pmatrix} = \begin{pmatrix} 9 \\ 12 \end{pmatrix}$ $x - 1 + 4 = 9$ $x = 6$ $2 - y + 6 = 12$	B1 B1 B1 3	
Mode = 9 Median = $\frac{7+8}{2}$ = 7.5		
16. a) $y = 8 - 12$ $y = -4$	B1	actual construction of the net

ANSWERS	MARKS	REMARKS
	B1	correct labelling
b) 5.8 ± 0.1	B1	value measured and not calculated
17.	3	
a) 3 + 5	B1	
	B1	
	B1	
b) 100%		
12% =	A1	
c) i) 10(		
25%	A1	
ii) 10(		
90%		
= 450, 000	M1	
Selling price for B = 300,000 + 75,000		
$A \rightarrow \frac{3}{15} \times 1500,000 = 300,000$		
$= 375,000$		
$B \rightarrow \frac{5}{15} \times 1500,000 = 500,000$		
450,000 + 375,000 = 825,000	M1	
$C \rightarrow \frac{7}{15} \times 1500,000 = 700,000$		
1,680,000 - 825,000 = 855,000	M1	
Profit = 855,000 - 700,000 = 155,000	M1	
$\frac{12}{100} \times 1,500,000 = 180,000$		
% profit =	A1	
	10	
$\frac{25}{100} \times 300,000 = 75,000$		
18. a) $v = 2 \times 3^2 - 3 \times 3 - 5$	M1	
= 4m/s	A1	
b) $2t^2 - 3t - 5 = 0$	M1	
$\frac{90}{100} \times 500,000 = 450,000$		
$2t^2 - 5t + 2t - 5 = 0$		
$t(2t - 5) + 1(2t - 5) = 0$		
$(t + 1)(2t - 5) = 0$	M1	
$t = -1$ or $t = 2.5$		

ANSWERS	MARKS	REMARKS
$\therefore$ t = 2.5	A1	
c) $a = \frac{dv}{dt}$		
$a = 4t - 3$	M1	
$a = (4 \times 2) - 3$ $= 5\ m/s^2$	A1	
d) $\frac{155,000}{700,000} \times 100\% = 22.1\%$	M1	
	M1	
	A1 10	
19. t = ½ hrs d = 30km	M1	
	A1	
b) i) Distance = $\int_2^5 (2t^2 - 3t - 5)dt$	M1	
Relative speed = 60 + 15 = 75km/h		
Relative distance = 30 - 7.5 = 22.5 km	M1	
Relative time = $\left[\frac{2t^3}{3} - \frac{3}{2}t^2 - 5t\right]_2^5$ $= \left(\frac{2\times3^3}{3} - \frac{3}{2}\times3^2 - 5\times3\right) - \left(\frac{2\times2^3}{3} - \frac{3}{2}\times2^2 - 5\times2\right)$ $= -10\frac{5}{6} + \frac{32}{3}$ $= \frac{1}{6}m$	M1 A1	
ii)	M1	

ANSWERS	MARKS	REMARKS
11 : 30 + 48		12 : 00 + 158
12 : 18 pm	A1	12 : 18 pm
c) $Speed = \frac{30}{\frac{1}{2}}$	M1	
$= 60km/hr$		
= 1330 hr or 01.30 pm	A1	
	10	
$15 \times \frac{1}{2} = 7.5km$		
20. Volume of hemisphere		
	M1	
	A1	
b) i) $\frac{22.5}{75}$		
	M1	
$7.5 + \left(\frac{22.5}{75} \times 15\right)$		
$= 12km$		
Slant height = 30 + 45 = 75	A1	$12 : 00 + \left(\frac{45}{15} \times 60\right)$
ii) Height of small cone $11 : 30 + \left(\frac{12}{15} \times 60\right)$		
Height of whole cone		
$t = 11 : 30 + \left(\frac{30}{15}\right)$	M1	for both heights
Volume of whole cone		
	M1	

ANSWERS	MARKS	REMARKS
Volume of small cone $= \frac{2}{3}\pi r^3$		
$= \frac{2}{3} \times 3.142 \times 7.5 \times 7.5 \times 7.5$	M1	
Volume of frustum = 4396.05-949.50		
$= 883.69 cm^3$		
= 3446.55cm³	A1	
c) Total volume = 883.69 + 3446.55 + 1440	M1	
= 5770.24cm³	A1	
	10	
21. a) i) **OM** = ½ **a** + ½ **b**	B1	
ii) **BQ** = -**b** + ¼ **a**	B1	
iii) AP = -**a** + $^2/_5$ **b**	B1	
b) i) **OX** = OB + BX		
= **b** + t (-**b** + ¼**a**)		
= b - t **b** + ¼ t**a**		
= (1 - t) **b** + ¼ t **a**	B1	
ii) **OX** = OA + AX		
= **a** + k (-**a** + $^2/_5$ **b**)		
= **a** - k**a** + $^2/_5$ k**b**		
= (1 - k) **a** + $^2/_5$ k**b**	B1	
iii)(1 - k) **a** + $^2/_5$ k**b** = (1 - t) **b** + ¼t**a**	B1	
1 - k = $^1/_4$t	B1	
4 - 4k = t		
4k + t = 4		
(2k + 5t = 5) 2	B1	attempt to solve for k and t
4k + t = 4		
4k + 10t = 10		
9t = 6		
t = $^2/_3$		
4k + $^2/_3$ = 4		
4k = $^{10}/_3$		
k = $^5/_6$	B1	for the values of t and k
c) AX : XP = 5 : 1	B1	

$= \sqrt{45^2 - 4.5^2}$

$= 44.77cm$

$= \sqrt{75^2 - 7.5^2}$

$= 74.62cm$

$= \frac{1}{3} \times 3.142 \times 7.5^2 \times 74.62$

$= 4396.05 cm^3$

$= \frac{1}{3} \times 3.142 \times 4.5^2 \times 44.77$

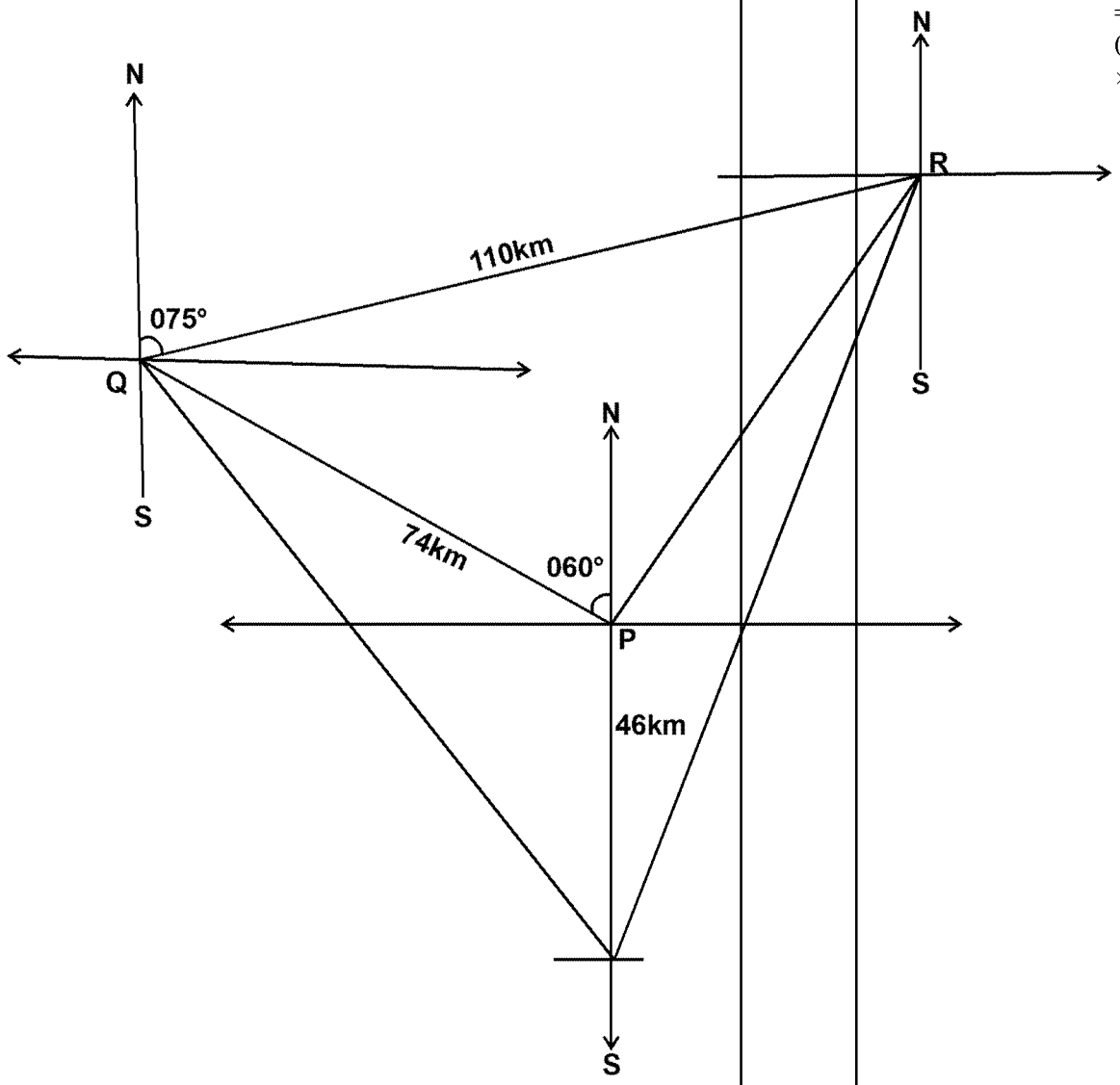
$= 949.50 cm^3$

ANSWERS	MARKS	REMARKS
	10	
22.		
b) i) RS = (11.6 ± 0.1) × 10	B1	
= 116 km ± 1	B1	
ii) Bearing of S from R = 200° ± 1°	B1	

ANSWERS	MARKS	REMARKS

c) QS

±



= (10.4 0.1) ×10

B1

= (104 ± 1)km ; B1

d) PR = 7.6 cm B1

23.

a) ∠BCA = 30° B1

Angles is alternate segment are equal B1

b) ∠ADC = 65° B1

Opposite angles in a cyclic quadrilateral add upto 180° B1

ANSWERS	MARKS	REMARKS
c) ∠COB = 70° Angle subtended by a chord / arc at the centre of a circle is twice the angle subtended by the same chord / arc at the circumference.	B1 B1	
d) ∠DGA = 40° Angles subtended by equal chords or arc at the circumference are equal	B1 B1	
e) ∠BEA = 85° Interior angles in a triangle add upto 180.	B1 B1 10	
24.