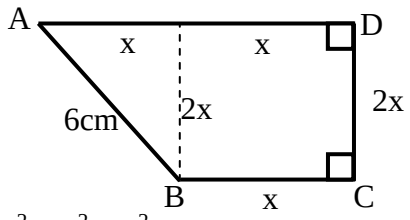
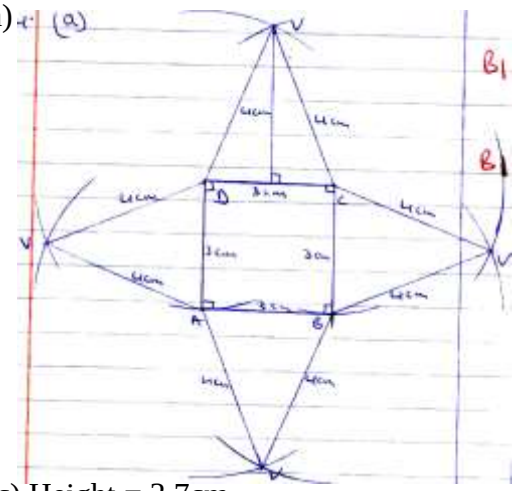
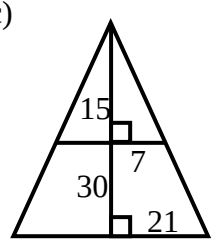
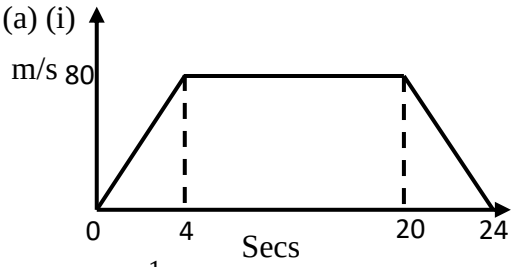
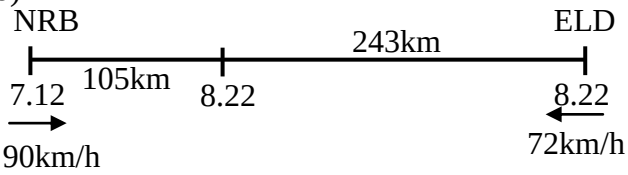
121/1
MATHEMATICS PAPER 1
MARKING SCHEME

1.	$\frac{\frac{5}{6}\ of\ \left(\frac{13}{3}-\frac{23}{6}\right)}{\frac{5}{12}\ x\ \frac{3}{25}+\frac{14}{9}\ x\ \frac{3}{7}}$ $=\frac{\frac{5}{6}x\frac{3}{6}}{\frac{1}{20}+\frac{2}{3}}$ $=\frac{\frac{5}{12}}{\frac{43}{60}}$ $=\frac{5}{12}$ x $\frac{60}{43}$ $=\frac{25}{43}$	M1 M1 A1	For $\frac{5}{12}$ For $\frac{43}{60}$ for answer
		03	
2.	$\sqrt{\frac{\overset{18}{\cancel{504}}\ x\ \overset{1}{\cancel{143}}\ x\ 910\ x\ 10}{\underset{1}{\cancel{28}}\ x\ 117\ x\ \underset{2}{\cancel{286}}\ x\ 7}}$ $=\sqrt{\frac{\overset{9}{\cancel{18}}\ x\ \overset{130}{\cancel{910}}\ x\ 10}{117\ x\ \underset{1}{\cancel{2}}\ x\ \underset{1}{\cancel{7}}}}$ $=\sqrt{\frac{9\ x\ 13\ x\ 100}{117}}$ $=\sqrt{100}$ = 10	M1 M1 A1	Simplify up to perfect square $\sqrt{100}$
		03	
3.	$\left(\frac{3^3}{2^3}\right)^{x+7}=\left(\frac{2^2}{3^2}\right)^{-3x}$ $\left(\frac{3}{2}\right)^{3(x+7)}=\left(\frac{3}{2}\right)^{6x}$ 3(x + 7) = 6x 3x + 21 = 6x x = 7	M1 M1 A1	
		03	
4.	30 = 2 x 3 x 5 50 = 2 x 5^2 35 = 5 x 7 L.C.M = 2 x 3x 5^2 x 7 = 1050 mins 17 hrs 30 mins Time = 7.18 +<u>17.30</u> 2448 ⇒ 12.48 a.m. Tuesday	B1 M1 A1	 For addition (Accept 0048h Tuesday)
		03	

5.	$x + y = 10$ $(10y + x) - (10x + y) = 54$ $9y - 9x = 54$ $y - x = 6$ $x + y = 10$ $\underline{-x + y = 6}$ $2y = 16$ $y = 8$ $x = 2$ Number is 28	M1 M1 A1	
		03	
6.	 $(2x)^2 + x^2 = 6^2$ $5x^2 = 36$ $x = 2.683$ Area $= \frac{1}{2}(x + 2x)(2x)$ $= \frac{1}{2}(3 \text{ x } 2.683)(2 \text{ x } 2.683)$ $= 21.595467$ ≈ 21.60 units	M1 A1 M1 A1	✓ Expression for height ✓ Expression for area Accept
		04	
7.	Inter. $\angle = x$ Exter. $\angle = y$ $x + y = 180^0$ $\underline{x - y = 108^0}$ $2x = 288$ $x = 144^0$ $\therefore$ ext. $\angle 36^0$ No. of sides $= \frac{360}{36}$ $= 10$ sides	B1 M1 A1	For the inter. $\angle$ and ext. $\angle$
		03	
8.	Let the commission be x% $\frac{x}{100}(500000 - 100000)$ $= 4000x$ $4000x + 10000 = 56000$ $x = 12.5\%$	M1 M1 A1	✓Expression of interest
		03	
9.	Vol. cylinder $\Rightarrow \pi(14^2)h$ Vol. cone $\Rightarrow \frac{1}{3}\pi(7^2)$ x 18 $\pi(14^2)h = \frac{1}{3}\pi(7^2)$ x 18 $h = \frac{1}{3}$ x 7^2 x 18 x $\frac{1}{14^2}$ $h = 1.5$cm	M1 M1 A1	For ✓ vol. expression for the cylinder & cone For equating to determine change in height
		03	

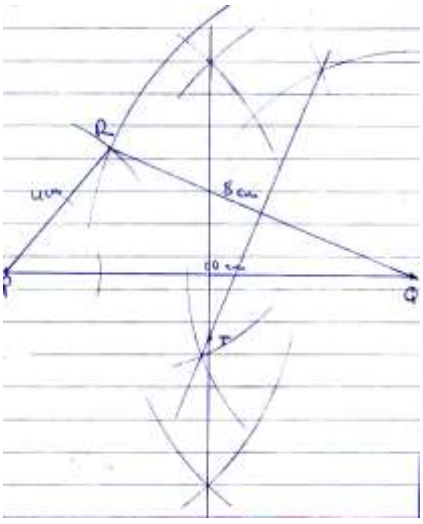
10.	$\frac{2x-4}{12-3x^2} - \frac{1}{3x+6}$ $\frac{2(x-2)}{3(2-x)(2+x)} - \frac{1}{3(x+2)}$ $-\frac{2}{3(2+x)} - \frac{1}{3(x+2)}$ $= -\frac{1}{x+2}$	M1 M1 A1	For ✓ factorization
		03	
11.	Present 4 yrs ago Daugther ⇒ x x – 4 Mother ⇒ 2.5x 2.5x – 4 $\frac{x-4}{2.5x-4} = \frac{1}{3}$ 3x – 12 = 2.5x – 4 0.5x = 8 x = 16 Mother = 2.5 x 16 = 40 years	M1 A1 B1	
		3	
12.	5y + 2x – 7 = 0 $y = -\frac{2}{5}x + \frac{7}{5}$ Gr. Line = $-\frac{2}{5}$ $\frac{k-5}{3--2} = \frac{-2}{5}$ k – 5 = -2 k = 3	B1 B1 A1	
		03	
13.	20000 x 147.86 = 2,957,200 $\frac{2957200-2512000}{74.50}$ = 5975.84	M1 M1 A1	
		03	
14.	(a)  (c) Height = 3.7cm		B1 ✓ Lines & angles drawn (allow ± 0.1cm) B1 ✓ Labelling B1 (Allow ± 0.1 cm)
			3

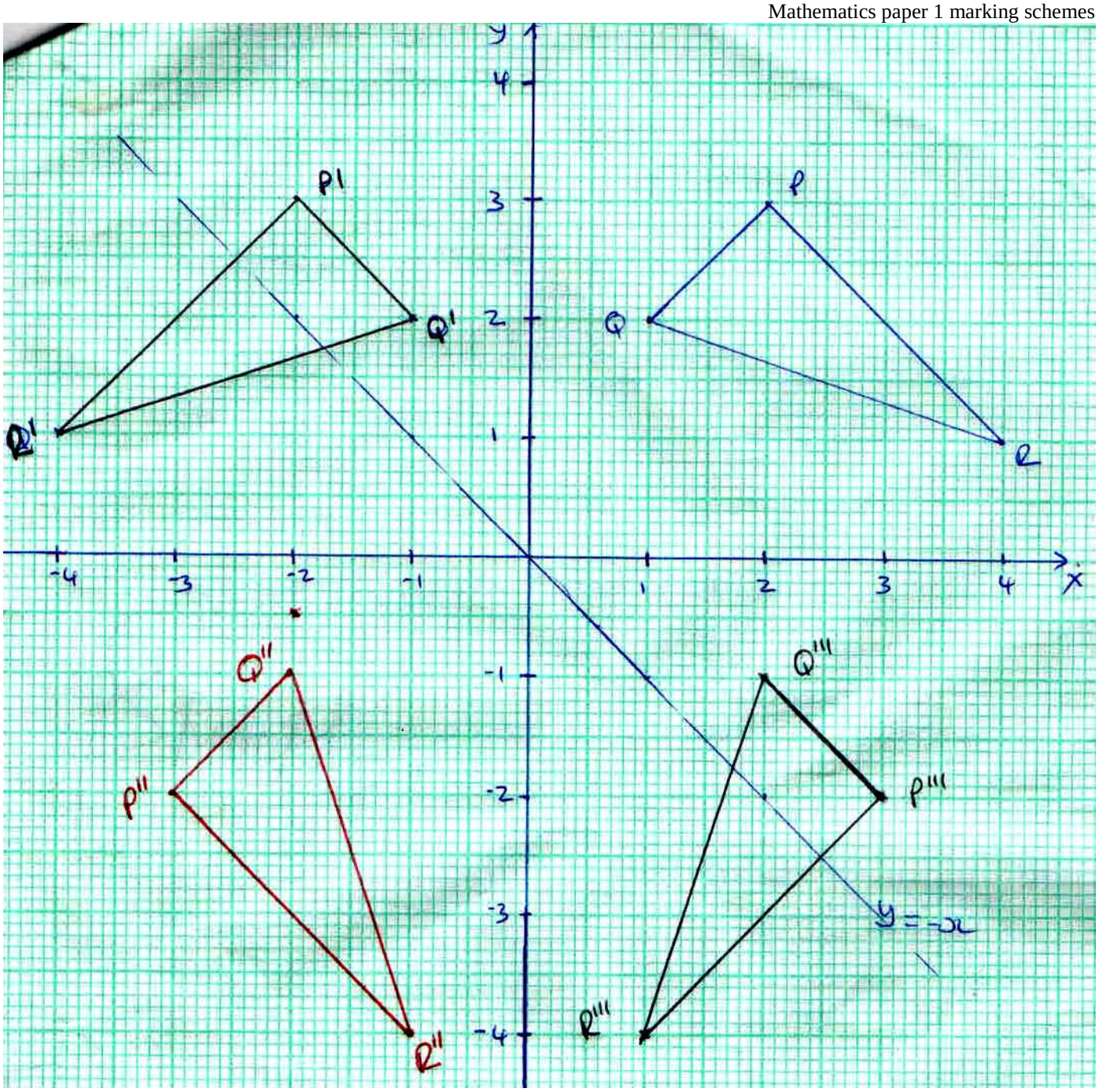
15.	No. / Log 849.6 / 2.9292 2.41 / 0.3820+ 3941 / 3.3112 3.5956- $\bar{1}.7156$ ÷ 3 8.039×10^{-1} / $\bar{1}.9052$ = 0.8039	M1 M1 M1 A1	✓ 3 Logs For addition and subtraction For ✓ ÷ 3
		04	
16.	$\frac{1}{0.3654}$ - 4.151^2 $\frac{1}{0.3654} \Rightarrow 2.737$ $4.151^2 \Rightarrow 17.231$ 2.737 – 17.231 = -14.494	B1 M1 A1	For both
		03	
17.	(a) Original members = x Original each = $\frac{180000}{x}$ Later each = $\frac{180,000}{x-3}$ $\frac{180,000}{x-3} - \frac{18000}{x} = 3000$ $\frac{60}{x-3} - \frac{60}{x} = 1$ $60x - 60x + 180 = x^2 - 3x$ $x^2 - 3x - 180 = 0$ (x – 15) (x + 12) = 0 x = 15 (b) $\frac{180,000}{15}$ = 12000 (c) Increase = 3000 $\frac{3000}{12000} \times 100$ = 25%	B1 B1 M1 M1 M1 A1 M1 A1 M1 A1	✓ Factorization
		10	
18.	(a) r : R = 1:3 (b) $\frac{7}{R} = \frac{1}{3}$ R = 21cm (c)  Vol. Big cone = $\frac{1}{3} \times \frac{22}{7} \times 21^2 \times 45$ = $20790cm^3$ Vol. Small cone = $\frac{1}{3} \times \frac{22}{7} \times 7^2 \times 15$ = $770cm^3$	B1 M1 A1 M1 M1	Alternative method: L.S.F = 1:3 V.S.F = 1:27 V.S.F frustum = 26 ∴ Vol. = 26 x 770 = 20020

	Vol. of frustrum = 20790 – 770 = 20020cm^3 (d) Vol. tank = 150 x 120 x 180 Buckets = $\frac{150 \, x \, 120 \, x \, 80}{20020}$ = 71.93 ≅ 72 full buckets	M1 M1 A1 B1	For subtraction
		10	
19.	(a) (i)  Distance = $\frac{1}{2}$ (16 + 24) x 80 = 1600m (ii) -$\frac{80}{4}$ = - 20m/s^2 (b)  Relative distance = 348 – $\left(90x\frac{7}{6}\right)$ = 243km Relative speed = 162km/hr Time taken = $\frac{243}{162}$hrs = 1.5 hrs Time = 8.22 + 1hr 30 mins = 9.52 a.m. (c) 90 x 2$\frac{2}{3}$km = 240km	M1 A1 M1 A1 B1 M1 M1 A1 M1 A1	 Accept deccel. = $\frac{80}{4}$ = 20m/s^2 For both R.D & R.S OR 348 – (1.5 x 72) = 240km
		10	
20.	(a) (i) Modal class = 30 – 39 Mean = $\frac{4449}{82}$ = 54.2561 ≅ 54.26	B1 B1 B1 M1 A1	 = For ✓x column For ✓ fx column Correct to 2 d.p

Marks	x	f	fx	cf
20-29	24.5	3	73.5	3
30-39	34.5	18	621	21
40-49	44.5	13	578.5	34
50-59	54.5	14	763	48
60-69	64.5	17	1096.5	65
70-79	74.5	12	894	77
80-89	84.5	5	422.5	82
			4449	

	(ii) Median $= 49.5 + \frac{41-34}{14} \times 10$ $= 54.5$ Diff $= 54.5 - 54.26$ $= 0.24$	B1 M1 A1	For cumulative freq.
		10	
21.	(a) A : B : C 25=: 30/= : 45/= 5 : 2 : 1 $100\% = \frac{(5\ x\ 25)+(30\ x\ 2)+(45\ x\ 1)}{5+2+1}$ = 28.75/= 20% profit $= \frac{20}{100} \times 28.75$ = 5.75/= (b) A = 27.5/= B = 33/= C = 49.5/= $\therefore\ 100\% = \frac{(27.5\ x\ 5)+(33\ x\ 2)+(49.5\ x\ 1)}{5+2+1}$ = 31.625 % Profit = 1.15 x 31.625 = 36.36875 ≅ 36.50 (c) 45 – 36.50 = 8.50 % Profit $= \frac{8.5}{36.5} \times 100$ = 23.29%	 M1 A1 M1 A1 M1 M1 A1 M1 M1 A1	 ✓ Expression for profit
		10	
22.	(a) $5.9^2 = 7.8^2 + 6.6^2 - 2(7.8)(6.6)\ \text{Cos P}$ $\text{Cos P} = \frac{69.59}{102.96}$ $P = 47.48^0$ (b) $\frac{5.9}{Sin 47.48^0} = 2R$ $R = \frac{5.9}{2Sin 47.48^0}$ = 4.002cm (c) Area of Δ $= \frac{1}{2} \times 7.8 \times 6.6\ \text{Sin}\ 47.48^0$ $= 18.97cm^2$ Area of circle $= 3.142 \times 4.002^2$ = 50.32 Shaded area = 50.32 -18.97 $31.35cm^2$	M1 M1 A1 M1 M1 A1 M1 M1 M1 M1 A	 For making Cos P subject ✓ Expression for area of triangle * Follow through for other π values ✓ Expression for area of circle For subtraction
		10	

23.	(a) 	B1 B1	For ✓ measurement with the given scale (1cm = 1km) For ✓ triangle labelled.
	(b) Construction of any 2 ⊥ side bisectors ✓Location of T Distance RT = 5.2km (c) Drop ⊥ from T to PQ Distance = 1.5km (d) $S = \frac{10+8+4}{2}$ = 11km $A = \sqrt{11(11-10)\,(11-8)(11-4)}$ $= 15.19868\text{km}^2$ $\cong 15.20\text{km}^2$	B1 B1 B1 B1 B1 M1 A1	 Allow ± 0.1km Allow ±0.1km * Allow any other alternative method by calculate only.
		10	
24.	(a) (i) ✓PQR drawn ✓$P^IQ^I R^I$ drawn (ii) Reflection on the line y – axis (or x = 0) (b) (i) $P^{II}(-3,-2)$, $Q^{II}(-2,-1)$, $R^{II}(-1,-4)$ ✓ $\Delta P^{II}Q^{II}R^{II}$ drawn (ii) Negative quarter turn about (0,0) OR (270^0) turn about (0,0) OR – 90^0 turn about (0,0) (c) $P^{III}(3,-2)$, $Q^{III}(2,-1)$, $R^{III}(1,-4)$ ✓$\Delta P^{III}Q^{III}R^{III}$ drawn (d) PQR and $P^IQ^IR^I$ PQR and $P^{II}Q^{II}R^{II}$ $P^IQ^IR^I$ and and $P^{III}Q^{III}R^{III}$ $P^{II}Q^{II}R^{II}$ and $P^{III}Q^{III}R^{III}$	B1 B1 B1 B1 B1 B1 B1 B1 B2	 Coordinates can be implied on the diagram Coordinates can be implied on the diagram - for 4 pairs - Allow B1 for at least 2 pairs
		10	


y
x
4
3
2
1
-1
-2
-3
-4
-4
-3
-2
-1
1
2
3
4
P'
Q'
R'
P
Q
R
Q''
P''
R''
Q'''
P'''
R'''
y = -x