NAME: ADM NO: CLASS:

GATITU SECONDARY SCHOOL, P.O. BOX 327 – 01030, GATUNDU.

FORM 4 MATHEMATICS P1 END OF TERM 1 EXAMINATION. 2014.

121/1 Mathematics Paper 1 . Time: $2^1/_2$ hours.

Instructions to Candidates.

i)This Paper contains two sections A and B

ii)Answer all the questions in A and any five in B .

iii)Use the space provided below each question to answer the questions.

iv)All working must be shown.

v)Slovenly work is highly penalized.

vi)KNEC Mathematical tables and non-programmable calculators (SILENT) may be used unless where stated otherwise.

SECTION a A (50 marks)

1.Evaluate:- $\sqrt{\frac{0.64 \times (1.69)^{\frac{1}{2}}}{(0.04)^{\frac{1}{2}} \times 38.44}}$ (4mks

$\sqrt{\frac{0.64 \times 1.3}{0.2 \times 38.44}}$

$\sqrt{\frac{0.832}{7.688}}$

$\sqrt{0.10822}$

$= 0.329$

2. Given that log y = 3.142 and log x = 2.421 evaluate log $x^4 - ¼ \log y^3$ (4mks

$4 \log x - \frac{3}{4} \log y$

$4 \times 3142 - \frac{3}{4} \times 2.421$

$12.568 - 1.816$

$= 10.752$

$4 \times 2.421 - \frac{3}{4} \times 3.142$

$9.684 - 2.357$

$= 7.327$

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3. The scale of a map is 1:125,000. What is the actual distance in kilometres represented by 16.8cm on the map? (3mks

$16.8 \times 125{,}000$

$= \frac{2{,}100{,}000}{100 \times 1000}$

21KM

4. A line L is perpendicular to the line $y = 3x$. If the line passes through point (0, 4) Find:

a)the gradient of L (1mk

$y = 3x$

$C_1 = 3$

$C_1 = -\frac{1}{3}$

$\frac{y-4}{x-0} = -\frac{1}{3}$

$y - 4 = -\frac{1}{3}x$

$y = -\frac{1}{3}x + 4$

b)the equation of L (3mks

5.A Kite whose verticles are P(0,8) Q(3,3), R(0,1) and S(-3,3) is rotated about the origin through 180°. Find the co-ordinates of its image. (4mks

$\begin{pmatrix}0\\0\end{pmatrix} - \begin{pmatrix}0\\8\end{pmatrix} = P'(0,-8)$

$\begin{pmatrix}0\\0\end{pmatrix} - \begin{pmatrix}3\\3\end{pmatrix} = Q'(-3,-3)$

$R(0,-1)$

$\begin{pmatrix}0\\0\end{pmatrix} - \begin{pmatrix}-3\\3\end{pmatrix} = S'(3,-3)$

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6. Factorise completely (2MKS)

a) $2x^2 - 32$

$2(x^2 - 16)$

$2\{(x+4)(x-4)\}$

(3mks

B) $t^3 + 8t^2 + 12t$

$t(t^2 + 8t + 12)$

$t^2 + 6t + 2t + 12$

$t(t+6)\ 2(t+6)$

$t\{(t+6)(t+2)\}$

7. Solve the following inequalities and illustrate your answer on a number line. (4mks

$12 - x \geq 5 \leq 2x - 2.$

$12 - x \geq 5$

$12 - 5 \geq x$

$x \leq 7$

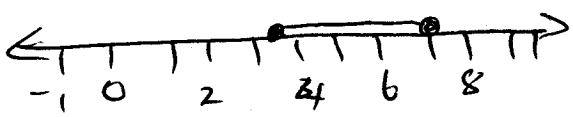
$5 \leq 2x - 2$

$7 \leq 2x$

$2x \geq 7$

$x \geq 3.5$

$3.5 \leq x \leq 7$



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8. Evaluate $\log_5 12.89$ leaving your answer correct to four significant figures. (3mks

$\log_5 12.89 = y$

$5^y = 12.89$

$y \log 5 = \log 12.89$

$y = \frac{\log 12.89}{\log 5}$

$y = \frac{1.1103}{0.699}$

$y = 1.58798$

$y = 1.6$

9. Make B the subject of the formula $D = \sqrt{\frac{B^2A^2 - E^2}{B^2}}$ (3mks

$D^2 = \frac{B^2A^2 - E^2}{B^2}$

$D^2B^2 = B^2A^2 - E^2$

$E^2 = B^2A^2 - D^2B^2$

$E^2 = B^2(A^2 - D^2)$

$\frac{E^2}{A^2 - D^2} = \frac{B^2(A^2 - D^2)}{A^2 - D^2}$

$\frac{E^2}{A^2 - D^2} = B^2$

$B = \sqrt{\frac{E^2}{A^2 - D^2}}$

10. Without using calculator evaluate $\frac{3\frac{1}{3} - 2\frac{2}{3} \div 1\frac{5}{9}}{\frac{3}{7} \text{ of } 3\frac{2}{3} + 3\frac{4}{7}}$ (3mks

$\frac{\frac{10}{3} - \frac{8}{3} \div \frac{14}{9}}{\frac{3}{7} \text{ of } \frac{11}{3} + \frac{25}{7}}$

$\frac{\frac{10}{3} - \frac{\cancel{8}^{4}}{\cancel{3}} \times \frac{\cancel{9}^{3}}{\cancel{14}}}{\frac{11}{7} + \frac{25}{7}}$

$\frac{\frac{10}{3} - \frac{12}{7} = \frac{70 - 36}{21}}{\frac{11}{7} + \frac{25}{7} = \frac{36}{7}}$

$\frac{34}{21} \div \frac{36}{7}$

$\frac{\cancel{34}^{17}}{\cancel{21}_{3}} \times \frac{7}{\cancel{36}_{18}}$

$\frac{17}{54}$ Qs $3.17b$

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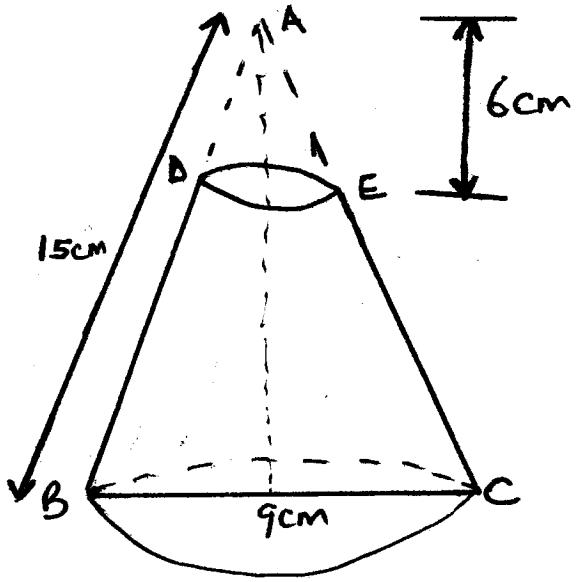
11. The figure below is a cone with the vertex at A and diameter BC. The cone is cut off along DE



a)Find the base radius of the cone A D E (3mks

$15^2 - (4.5)^2$

$225 - 20.25$

$h = \sqrt{204.75}$

$h = 14.3$

$\frac{4.5}{x} = \frac{14.3}{6}$

$\frac{4.5 \times 6}{14.3} = x$

$\frac{27}{14.3} = x$

$x = 1.888$

$x = 1.9\text{cm}$

b)Find the volume of the frustum. (4mks

$V = \frac{1}{3}\pi R^2 H - \frac{1}{3}\pi r^2 h.$

$\frac{1}{3} \times 3.142 \times (4.5)^2 \times 14.3$

$= 303.28\text{cm}^3$

$\frac{1}{3} \times 3.142 \times (1.9)^2 \times 6$

22.69cm^3

$V = 303.28 - 22.69$

280.59cm^3

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12. Find the sum of eight terms of the series below.

2 + 6 + 18 + _____

$S_n = \frac{a(r^n - 1)}{r - 1}$

$S_8 = \frac{2(3^8 - 1)}{3 - 1}$

$\frac{2(6561 - 1)}{2}$

$\frac{2(6560)}{2}$

$= 6,560$ (2mks

13. Points A*(2,4), B(3, 7) and C(5, 13) are three points. State whether the points are collinear. (3mks

$AB = \begin{pmatrix} 3 \\ 7 \end{pmatrix} - \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$

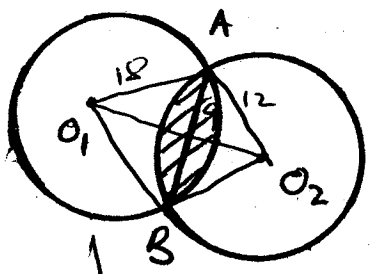
$BC = \begin{pmatrix} 5 \\ 13 \end{pmatrix} - \begin{pmatrix} 3 \\ 7 \end{pmatrix} = \begin{pmatrix} 2 \\ 6 \end{pmatrix}$

$AC = \begin{pmatrix} 5 \\ 13 \end{pmatrix} - \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 3 \\ 9 \end{pmatrix}$

$2AB = BC$

SECTION 'B'

14. The circles with centres O_1 and O_2 have radii 18cm and 12cm respectively and the chord AB is 18cm long.



$\sin\theta = \frac{9}{18}$

$\sin\theta = \frac{1}{2}$

$\theta = 30$

$\theta = 60^\circ$

$\sin\theta = \frac{9}{12}$

$\sin\theta = 0.75$

48.6

$\theta = 97.1$

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a)Find the length O_1 O_2 (3mks

$18^2 - 9^2$

$324 - 81$

$\sqrt{243}$

$15.6\,cm$

$144 - 81$

$\sqrt{63}$

$7.9\,cm$

O_1O_2 $7.9 + 15.6$

$O_1O_2 = 23.5\,cm$

b)Find the common area between the two intersecting circles. (7mks

$\frac{60}{360} \times 18 \times 18 \times 3.142$

$= 169.67\,cm^2$

$\frac{1}{2} \times 18 \times 18 \sin 60$

$162 \sin 60$

$140.30\,cm^2$

$169.67 - 140.30$

$29.37\,cm^2$

$\frac{97}{360} \times \frac{1}{2} \times 12 \times 12 \times 3.142$

305

$= 122.04\,cm^2$

$\frac{1}{2} \times 144 \sin 97.1$

$72 \sin 97.1$

$= 71.45\,cm^2$

$122.04 - 71.45$

$50.59\,cm^2$

T.A $= 50.59 + 29.37$

$79.96\,cm^2$

15. Find the vertices of a triangle defined by the intersection of the lines. (5mks

$Y = x$, $y - 1 = -3$, $X = 5$

$y = x$

x	1	2	3	4
y	1	2	3	4

$y - 1 = -3x + 15$

$y = -3x + 16$

x	0	1	2	3	4	5
y	16	13	10	7	3	1

$3y - 6 = 2 - x$

$3y = 8 - x$

x	0	2	5	6
y	2.7	2	1	0.7

$y = x$

$y = -3x + 16$

$x = -3x + 16$

$4x = 16$

$x = 4$

$y = 4$

$(4, 4)$

$y = x$

$3y = 8 - x$

$3x = 8 - x$

$4x = 8$

$x = 2$

$x = 2$

$y = 2$

$(2, 2)$

$y = -3x + 16$

$3y = -x + 8$

$3(-3x + 16) = -x + 8$

$-9x + 48 = -x + 8$

$40 = -8x$

$x = -5$

$y = 15 + 16$

$y = 31$

$(-5, 31)$

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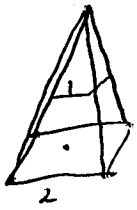
b)Find the equations of the tangents to the circle $2x^2 + 2y^2 - 4x + 2y - 10 = 0$ which are parallel to the y – axis. (5mks

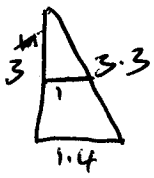
16) A hopper used in building construction is a frustrum of a right pyramid with a square bottom and a square top of side 2m and 1 m respectively. If the height of the hopper is 1.5m, find surface area. (10mks)

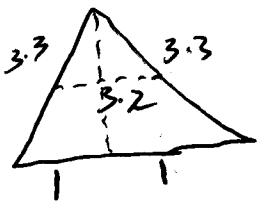


$\frac{2}{1} = \frac{x+1.5}{x}$

$2x = x + 1.5$

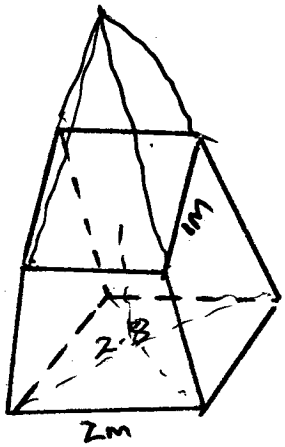
$x = 1.5$





$\frac{1}{2} \times 2 \times 3.2 = 3.2$

$3.2 \times 4 = 12.8M^3$



$\frac{2}{1} = \frac{3.3}{x}$

$x = \frac{3.3}{2}$

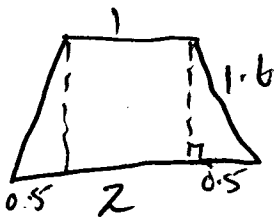
$\frac{1}{2} \times 1 \times 1.6 \times 4 = 3.2M^2$

$12.8 - 3.2 = 9.6M^2$

$2 \times 2 \quad 4$

$1 \times 1 \quad 1$

$14.6M^2$



$1.6^2 - 0.5^2$

$(2.56M - 0.25)$

$\sqrt{2.31}$

1.5

$\frac{1}{2}(2+1) \times 1.5$

$\frac{3}{2} \times 1.5 \times 4$

$9M^2$

$5M^2$

$14.0M^2$

$4.5M^2$

$9.5M^2$

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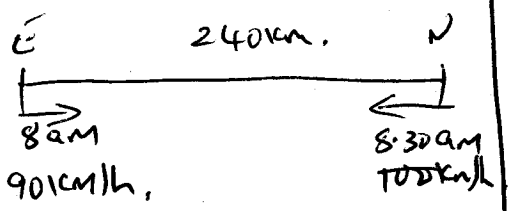
17. A motorist left Embu for Nairobi a distance of 240 km at 8 a.m. and travelled at an average speed of 90 kph. Another motorist left Nairobi for Embu at 8.30 a,m and travelled at 100 kph . Find

a)The time they met. (6mks



$90 \times \frac{1}{2} = 45$ km.

$D = 240 - 49$
$= 195$ km.

R.S $= 190$ km/h.

$T = \frac{195}{190} = 1.02$ hrs.
$= 1.02$ min.

8.30
+ 1.02
9.32 AM

b)How far they met from Nairobi. (4mks

100×1.02

$= 102.63$ km

18. The following are masses of fish in kilogrammes caught by fishermen in one day.

Mass	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39
No of Fish	2	6	20	12	10	5	6	2

Using a frequency distribution table find

a)Mean (4mks

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b)Median

class	x	f	fx
0-4	2	2	4
5-9	7	6	42
10-14	12	20	240
15-19	17	12	204
20-24	22	10	220
25-29	27	5	135
30-34	32	6	192
35-39	37	2	74
		$\Sigma f = 63$	$\Sigma fx = 1111$

$\bar{x} = \frac{1111}{63}$

$= 17.63$

median.

$14.5 + \left(\frac{4}{12} \times 5\right)$

(5mks

$14.5 + \frac{20}{12}$

$14.5 + 1.67$

16.17

c)State the modal class (1mk

$10 - 14$

19.Given $y = \sin 3x$ and $y = \cos {}^{2}/_{3}x$ draw their graphs on the same axis for $0 \leq x \leq 360^{\circ}$ (6mks

i)From your graph find:-

a)the period of $y = \sin 3x$ (2mks

b)the value (s) of X for which $\sin 3x = \cos {}^{2}/_{3}x$ (2mks

20. Solve the following pairs of simultaneous equations

i)$4x - 2y = 3$

$3x + y = -3$ (3mks

$4x - 2y = 3$

$6x + 2y = -6$

$10x = -3$

$x = \frac{-3}{10}$

$x = -0.3$

$-0.9 + y = -3$

$y = -3 + 0.9$

$y = -2.1$

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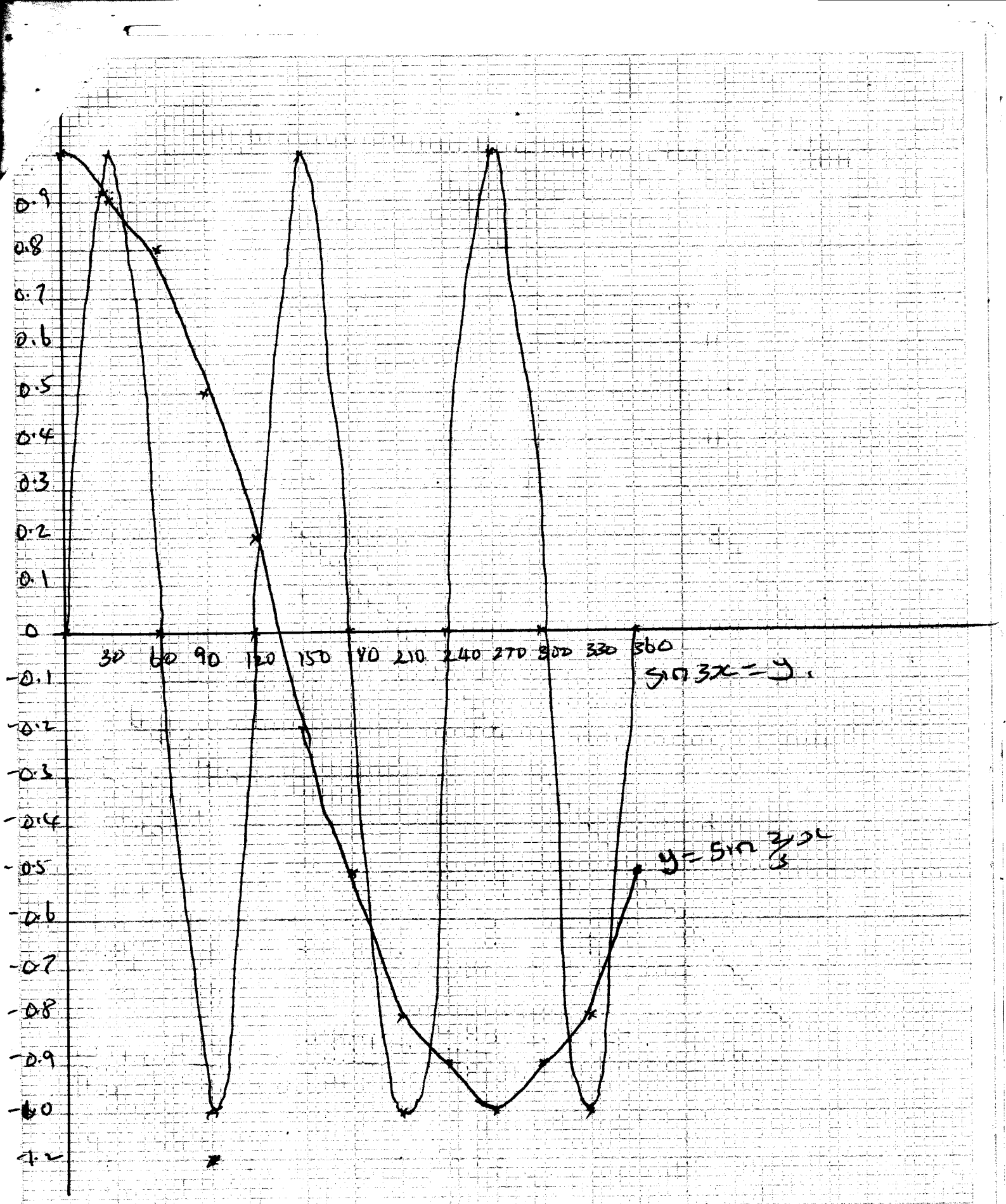

(a) 1

(b) 24, 42, 120, 192, 228, 318

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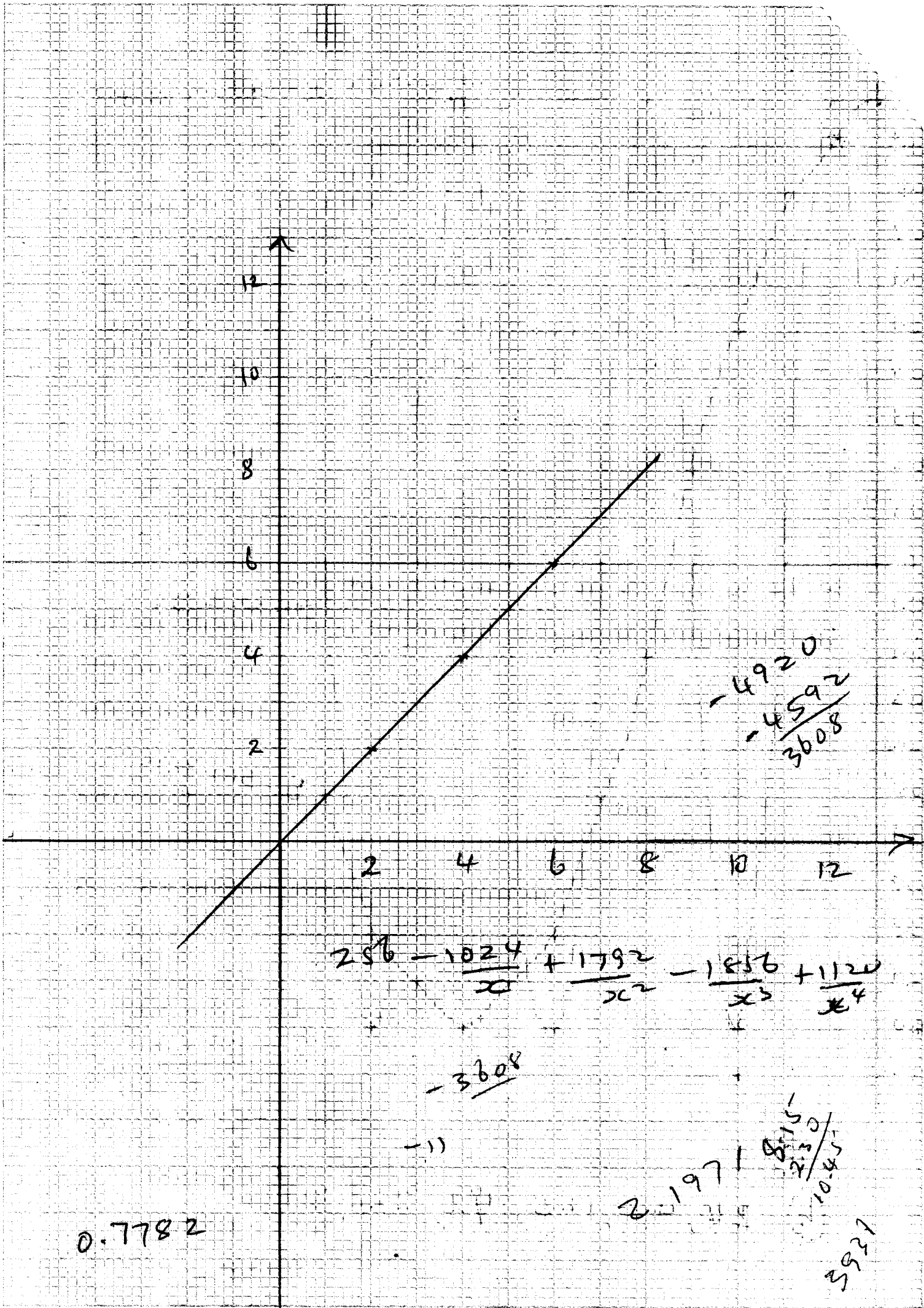

$$256 - \frac{1024}{x} + \frac{1792}{x^2} - \frac{1536}{x^3} + \frac{1120}{x^4}$$

-4920

-459^2

$-459/3608$

-3608

-11

0.7782

2.197

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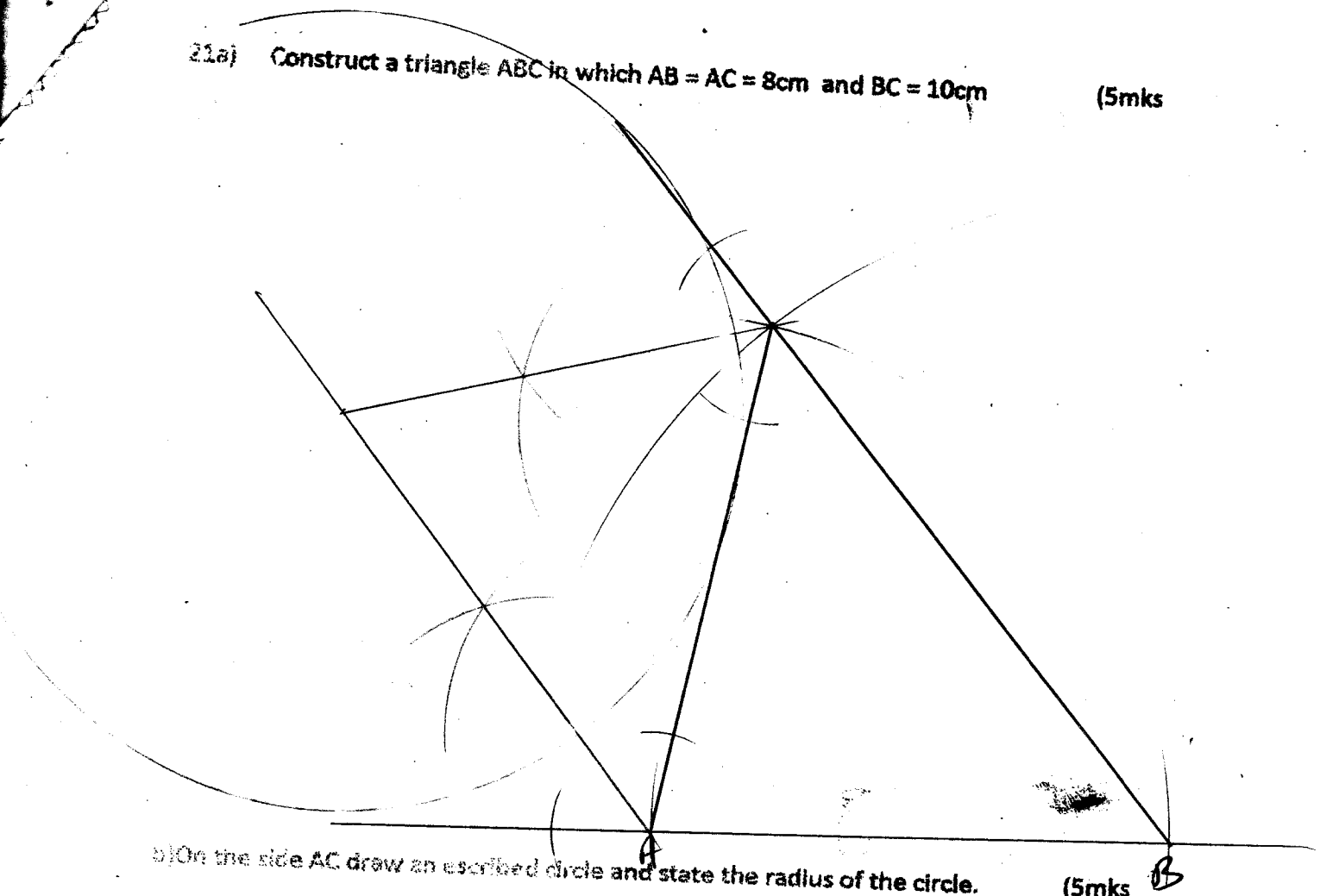
21a) Construct a triangle ABC in which AB = AC = 8cm and BC = 10cm (5mks



b) On the side AC draw an escribed circle and state the radius of the circle. (5mks

R = 6.2cm

11 $3a+5b=20$

$6a-5b=12$

$9a=32$

$a=\frac{32}{9}$

$3\left(\frac{32}{9}\right)+5b=20$

$\frac{96}{9}+5b=20$

$5b=20-\frac{96}{9}$

$5b=\frac{180-96}{9}$

$b=\frac{84}{45}=1.87$

$a=\frac{32}{9}=3.5$

(b) $E=x$

$M=20+x$

$M \Rightarrow \frac{3}{4}(20+x)$

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

$\frac{4}{5}x-\frac{3}{4}(20+x)=10$

$\frac{4}{5}x-\frac{60}{4}-\frac{3}{4}x=10$

$\frac{16-15}{20}=10+15$

$\frac{1}{20}x=25$

$x=25\times 20$

$x=500$

$E=500$

$M=520$

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$y = \sin 3x$

x	0	30	60	90	120	150	180	210	240	270	300	330	360
$\sin 3x$	0	1	0	0	0	1	0	-1	0	1	0	-1	0
$\cos \frac{3}{5}x$	1	0.9	0.8	0.5	0.2	-0.2	-0.5	-0.8	-0.9	-1	-0.9	0.5	-0.2

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