

FOCUS A365

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ADM
 NAME *Teacher's Copy*
 CLASS FORM 3
 DATE
 SCHOOL ST. CLARE GIRLS SECONDARY SCHOOL - GATITU

KCSE | MID-TERM EXAMS | MATHEMATICS | TERM 1 | 2018

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CANDIDATE'S SCORE			MAXIMUM SCORE
Section A.	Section B.	Total	100

Teacher's Comment

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Instructions:

1. Write your name, class and ADM number in the spaces provided above.
2. Answer **all** the questions in section A and only 5 questions in section B.
3. All workings must be **clearly shown** on the question paper provided.
4. Confirm that 14 pages are printed and you are provided with a graph papers
5. Any acts of **cheating** will render your examinations nullified
6. For any queries, please confirm with the invigilator.

This paper takes strictly 2 ½ hours



Section A: Answer All Questions in this Section (50 Marks)

1) Solve the simultaneous equations

3 mks

$$6x - 4y = -4$$

$$5x + 2y = 2$$

$$(6x - 4y = -4) \times 1$$

$$(5x + 2y = 2) \times 2$$

$$6x - 4y = -4 \quad \checkmark M=1$$

$$10x + 4y = 4$$

$$-16x = 0$$

$$x = 0 \quad \checkmark$$

$$6(0) = 4y$$

$$y = \frac{-4}{4}$$

$$y = -1 \quad \checkmark$$

2) Simplify the expression.

2 mks

$$\frac{24m + 8n}{n + 3m}$$

$$\frac{8(3m+n)}{n+3m} = 8 \quad \checkmark$$

3) Without using a calculator, evaluate for y in;

3 mks

$$\frac{1}{y} = \frac{1}{24.3} + \frac{1}{13.1}$$

$$\frac{1}{y} = 0.04115 + 0.07634 \quad \checkmark$$

$$\frac{1}{y} = 0.1175$$

$$y = \frac{1}{0.1175} \quad \checkmark \therefore y = 8.51 \quad \checkmark$$

4) Solve for x in the equation.

3 mks

$$4^{x+1} \times \left(\frac{1}{32}\right)^{2-x} = 16^{x-\frac{1}{2}}$$

$$2^{2(x+1)} \times 2^{-5(2-x)} = 2^{4(x-\frac{1}{2})}$$

$$2^{2x+2} \times 2^{-10+5x} = 2^{4x-2} \quad \checkmark M=1$$

$$2^{7x-8} = 2^{4x-2}$$

$$7x-8 = 4x-2 \quad \checkmark M=1$$

$$3x = 6$$

$$x = 2 \quad \checkmark A=1$$



- 5) Without using a calculator or log tables, solve.

3 mks

$$\frac{\log_2 \frac{1}{4} + \log_2 64}{\log_2 32 - \log_2 \frac{1}{8}}$$

$$\frac{\log_2 2^{-2} + \log_2 2^6}{\log_2 2^5 - \log_2 2^{-3}} = \frac{\log_2 2^4}{\log_2 2^8} = \frac{4}{8} = \frac{1}{2} \quad \text{or}$$

$$\frac{\log_2 (\frac{1}{4} \times 64)}{\log_2 (32 \times 8)} = \frac{\log_2 16}{\log_2 256} = \frac{\log_2 2^4}{\log_2 2^8} = \frac{4}{8} = \frac{1}{2}$$

- 6) The scale of a map is given as 1:50,000. Find the actual area in hectares of a region represented by a rectangle of sides 6cm by 7cm. (give your answer to the nearest whole number). 3 mks

$$\begin{aligned} \text{Area} &= 6 \times 7 \\ &= 42 \text{ cm}^2 \\ 1 \text{ cm} &\rightarrow 50000 \quad \checkmark M=2 \\ 1 \text{ cm}^2 &\rightarrow 50000 \times 50000 \\ &\rightarrow \frac{42 \times 50000 \times 50000}{100 \times 100 \times 10000} \\ &\rightarrow 1050 \text{ Ha.} \quad \checkmark 1 \end{aligned}$$

- 7) A salesman is paid a commission of 5% on goods worth over Ksh. 500,000. He is also paid a monthly salary of Ksh. 30,000. Calculate the total earnings in a month when his sales was Ksh. 600,000. 3 mks

$$\begin{aligned} \frac{5}{100} \times 500000 &= 30,000 \quad \checkmark M=2 \\ &= 30000 + 30000 \\ &= 60,000 \quad \checkmark A=1 \end{aligned}$$



- 8) The sum of three consecutive odd numbers is 69. What are the numbers? 2 mks

$$x, x+2, x+4$$

$$x+x+2+x+4=69 \quad \checkmark M_1$$

$$3x+6=69$$

$$3x=63$$

$$x=21, 23, 25 \quad \checkmark A_1$$

- 9) The sum of interior angles of a polygon is 1440° , find; The number of sides of the polygon. 2 mks

$$(n-2)180 = 1440$$

$$180n - 360 = 1440 \quad \checkmark M_1$$

$$\frac{180n}{180} = \frac{1440 + 360}{180}$$

$$n = 10 \quad \checkmark A_1$$

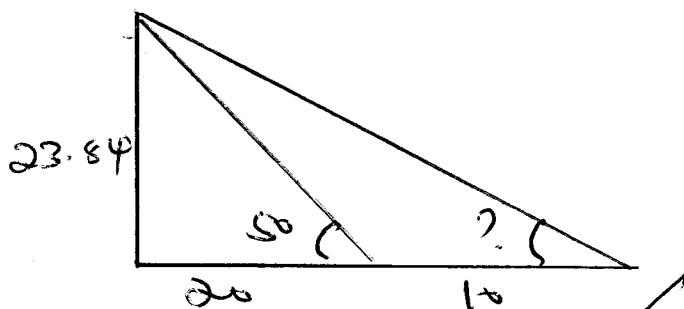
- b) The number of triangles formed when drawn from one vertex of the polygon to another vertices 2 mks

$$\text{No of triangles} = n - 2$$

$$= 10 - 2$$

$$= 8 \text{ triangles}$$

- 10) At a point 20m from the foot of a tree is 50° , what will be the angle of elevation of the top of the tree from a point 30m away from the tree? 4 mks



$$\tan 50 = \frac{\text{opp}}{20} \quad \checkmark M_1$$

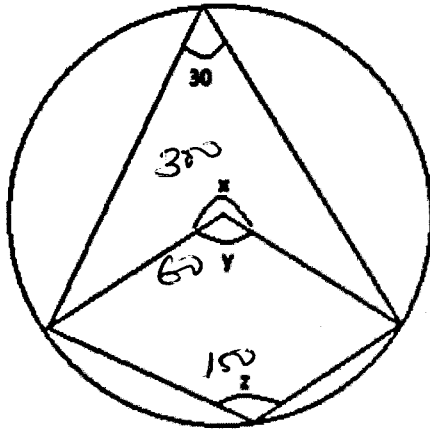
$$20 \tan 50 = \text{opp} = 23.84$$

$$\tan \theta = \frac{23.84}{30} \quad \checkmark M_2$$

$$\tan \theta = 0.7947$$

$$\tan \theta = 38.47 \quad \checkmark A_1$$

- 11) Find the value of x , y , and z in the figure below if O is the centre of the circle and $\angle ABC = 30^\circ$ 3 mks



$$\begin{aligned}
 x &= 300 \\
 y &= 60 \\
 z &= 150
 \end{aligned}$$

- 12) Make d the subject of the formula. 3 mks

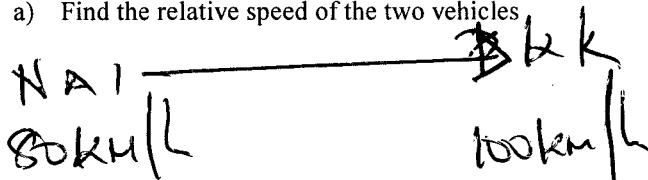
$$v = \sqrt{gd\left(1 + \frac{3h}{6}\right)}$$

$$v^2 = gd\left(1 + \frac{3h}{6}\right)$$

$$d = \frac{v^2}{g\left(1 + \frac{3h}{6}\right)}$$

- 13) A van left Nairobi for Kakamega at average speed of 80km/h. After half an hour, a car left Nairobi for Kakamega at speed of 100km/h.

- a) Find the relative speed of the two vehicles 2 mks



$$\text{R. speed} = 100 - 80$$

$$= 20 \text{ km/h}$$

✓ A₁

b) How far from Nairobi did the car overtake the van?

3 mks

$$D = \frac{S \times T}{\cancel{P}}$$

$$= 80 \times \frac{1}{2}$$

$$= 40 \text{ km}$$

✓ $M=2$

B will overtake A at

$$= \frac{40}{20} \text{ hrs} = 2 \text{ hrs}$$

$$D = 100 \times 2$$

$$= \underline{\underline{200 \text{ km}}}$$

✓ $A=1$

14) Solve the simultaneous inequality below:

3 mks

$$x + 3 > 5$$

$$x - 4 < 4$$

$$x + 3 > 5$$

$$x > 2$$

✓

$$x - 4 < 4$$

$$x < 8$$

✓

$$2 < x < 8$$

✓

15) Factorise the expression

3 mks

~~$$x^2 + 6x + 5$$~~

$$6x^2 + 7x + 5$$

$$6x^2 + 10x - 3x + 5$$

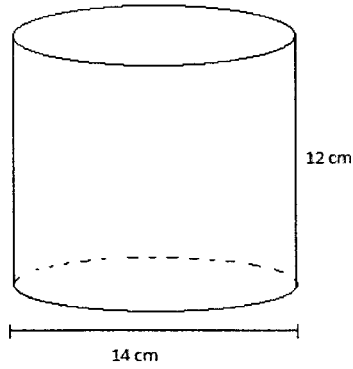
$$2x(3x + 5) - 1(3x + 5)$$

$$(2x - 1)(3x + 5)$$



16) Calculate the surface area of the closed solid below;

3 mks



$$\left(\frac{22}{7} \times 7 \times 7 \times 2\right) + \left(\frac{22}{7} \times 14 \times 12\right)$$

$$\sqrt{M_1} 308 + 528 \sqrt{M_1}$$

$$= 836 \text{ CM}^2 \sqrt{A_1}$$

Section B: Answer any five Questions in this Section (50 Marks)

17) In a Kiswahili test, 40 students scored the following marks;

43	39	59	56	58	63	71	40
72	66	47	38	51	50	61	64
32	78	29	32	45	80	70	57
52	46	45	39	58	72	41	55
56	53	66	63	61	46	82	64

Using a class interval of size 5 and 25-29 as the first class.

i) Make a frequency distribution table

5 mks

Class	Tally	f	Midpoint	$\sum fx$
25-29		1	27	27
30-34		2	32	64
35-39		3	37	111
40-44		3	42	126
45-49		5	47	235
50-54		4	52	208
55-59		7	57	399
60-64		6	62	372
65-69		2	67	134
70-74		4	72	288
75-79		1	77	77
80-84		2	82	164

$\sum x = 654$

$\sum f = 40$

$\sum fx = 2205$

ii) Find the modal class

1 mk

55-59 ✓

iii) Calculate;
a) median

2 mks

20th $54.5 + \frac{2}{7} \times 5 = 55.93$

21st $54.5 + \frac{3}{7} \times 5 = 56.64$

$\frac{55.93 + 56.64}{2}$

$= 56.29$ ✓ A1

b) mean

2 mks

Mean = $\frac{\sum fx}{\sum f}$

$= \frac{2205}{40}$

$= 55.125$ ✓ A1



18) Given the ordered pair of the points on the line AB as (-6,-9), (-4,-6), (-2,-3), (0,0):

a) Find the equation of line AB;

2 mks

$$\frac{-3 - -6}{-2 - -4} = \frac{-3 + 6}{-2 + 4} = \frac{3}{2} = 1.5, (-4, -6) (x, y)$$

$$\checkmark M_1 \quad \frac{y + 6}{x + 4} = \frac{3}{2} \quad \therefore y = \frac{3}{2}x$$

$$\checkmark A_1$$

b) Find the values of y when x=1 and y=2.

2 mks

When $x=1$ When $y=2$

$$y = \frac{3}{2} \quad x = \frac{4}{3}$$

\checkmark \checkmark

c) Draw line AB and $y = \frac{1}{2}x + 2$ on the Cartesian plane

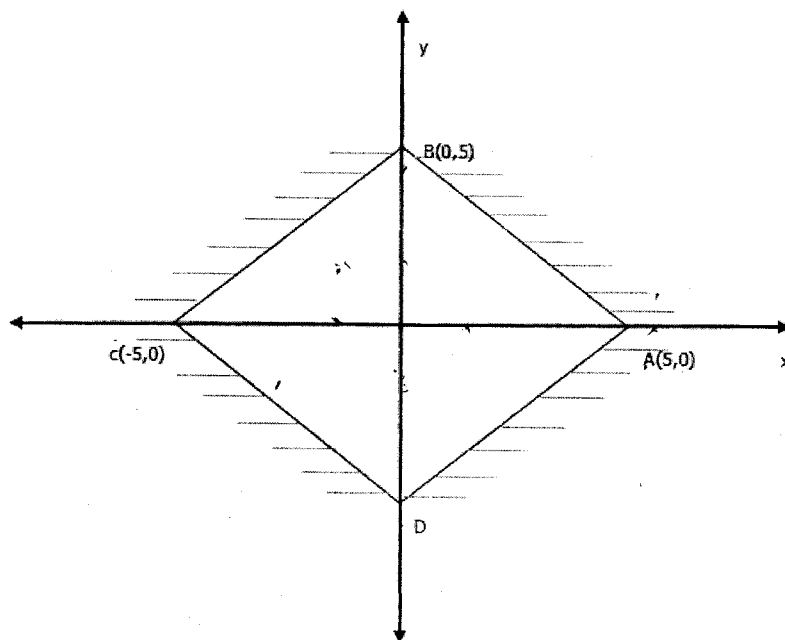
4 mks

d) Use your graph to find the values of x and y that satisfy both equations in (c) above.

2 mks

$(2, 3)$

19) The figure below shows a square ABCD with vertices A(5,0), B(0,5), C(-5,0) and D



a) Determine the coordinate of point D.

2 mks

$(0, -5)$



b) Write down the equations of line AB, CD, CB and AD

4 mks

Line AB $\left\{ \begin{array}{l} A(5,0) \\ B(0,5) \end{array} \right\}$ Grad = $\frac{5-0}{0-5} = \frac{5}{-5} = -1$

$$\frac{y-0}{x-5} = -1$$

$$y = -x + 5 \quad \checkmark$$

Line CB $\left\{ \begin{array}{l} C(-5,0) \\ B(0,5) \end{array} \right\}$ Grad = $\frac{-5-0}{0-5} = \frac{-5}{-5} = 1$

$$\frac{y-0}{x+5} = 1$$

$$y = x + 5 \quad \checkmark$$

Line CD $\left\{ \begin{array}{l} C(-5,0) \\ D(0,-5) \end{array} \right\}$ Grad = $\frac{-5-0}{0-5} = \frac{-5}{-5} = 1$

$$\frac{y-0}{x+5} = 1$$

$$y = x - 5 \quad \checkmark$$

Line AD $\left\{ \begin{array}{l} A(5,0) \\ D(0,-5) \end{array} \right\}$ Grad = $\frac{-5-0}{0-5} = \frac{-5}{-5} = 1$

$$\frac{y-0}{x-5} = 1$$

$$y = x - 5 \quad \checkmark$$

c) Write down the inequalities that determine the square.

4 mks

Line AB $y = -x + 5$

$$y \leq -x + 5 \quad \checkmark$$

Line CB $y = x + 5$

$$y \leq x + 5 \quad \checkmark$$

Line CD $y = x - 5$

$$y \geq x - 5 \quad \checkmark$$

Line AD $y = -x + 5$

$$y \geq -x + 5 \quad \checkmark$$

20) A salesperson is paid a commission of 20% on goods sold worthy over sh.100,000. She is also paid a monthly salary of sh.12,000. In a certain month she sold 360 books at sh.500 each.

a) Calculate the salesperson's earning that month.

3 mks

$$360 \times 500 = 180,000 \quad \checkmark M_1$$

$$\text{Commission} = \frac{20}{100} \times 180,000 = 36,000$$

$$\text{Earning } 36,000 + 12,000 \quad \checkmark M_1$$

$$= 48,000 \quad \checkmark M_2$$

- b) In the following month, the salesperson's earning was sh.17,600. Calculate:
- i) The total amount of money received from sales that month. 3 mks

$$\begin{array}{r}
 17600 \\
 -12000 \\
 \hline
 5600
 \end{array}$$

$5600 \rightarrow 202$
 $? \leftarrow 102$
 $= \frac{100}{20} \times 5600$
 $= 28,000 \text{ shillings}$

- ii) The number of books sold that month. 2 mks

$$\frac{28,000}{56} = 500 \text{ books}$$

- c) 10 chicken can lay 10 eggs in 10 days. How many eggs will 100 chicken lay in 100 days on the same rate? 2 mks

chicken	eggs	days
10	10	10
100		100

$$\frac{100}{10} \times 10 \times \frac{100}{10} = 1000 \text{ eggs}$$

21. A slaughter house bought a number of goats at sh.2,000 each and a number of bulls at sh.15,000 each. They a total of sh.190,000. If they bought twice as many goats and three bulls less, they would have saved sh.5000.
- a) Find the number of each type of animals bought. 6 mks

Let the number of goats be x and the number of bulls be y

$$2000x + 15000y = 190000 \quad \sqrt{1mk} \dots \text{divide both sides by 1000 you get:}$$

$$2x + 15y = 190 \dots (\text{eqn } i)$$

If they had bought twice as much for goats and 3 bulls less, they could have saved sh. 5000

$$\text{Therefore: } 2(2000x) + (15000y - (15000 \times 3)) = 190000 - 5000 \quad \sqrt{1mk}$$

$$4000x + 15000y - 45000 = 185000$$

$$4000x + 15000y = 230000 \dots \text{divide both sides by 1000 you get:}$$

$$4x + 15y = 230 \dots (\text{eqn } ii)$$

Solving the simultaneous equations using eliminations method:

$$2x = 40 \quad \sqrt{1mk} \text{ therefore } x = 20$$

Substitute $x = 20$ to eqn 1

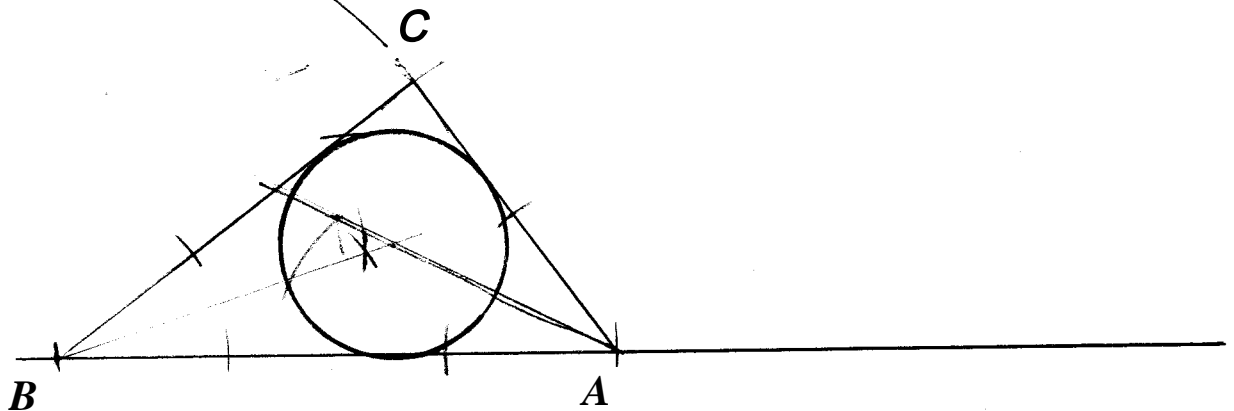
$$2(20) + 15y = 190 \quad \sqrt{1mk} \text{ this results to } 15y = 150 \text{ therefore } y = 10$$

The number of goats therefore were $20\sqrt{1mk}$ and bulls $10\sqrt{1mk}$

- b) If the slaughter house sold all the animals at a profit of 25% per goat and 30% per 4 mks
bull. Calculate the total actual profit in shillings

$$\begin{aligned} & \frac{25}{100} \times 2000 \times 20 + \frac{30}{100} \times 15000 \times 10 \\ & = 10000 + 45000 \\ & = \text{sh } 55000 \end{aligned}$$

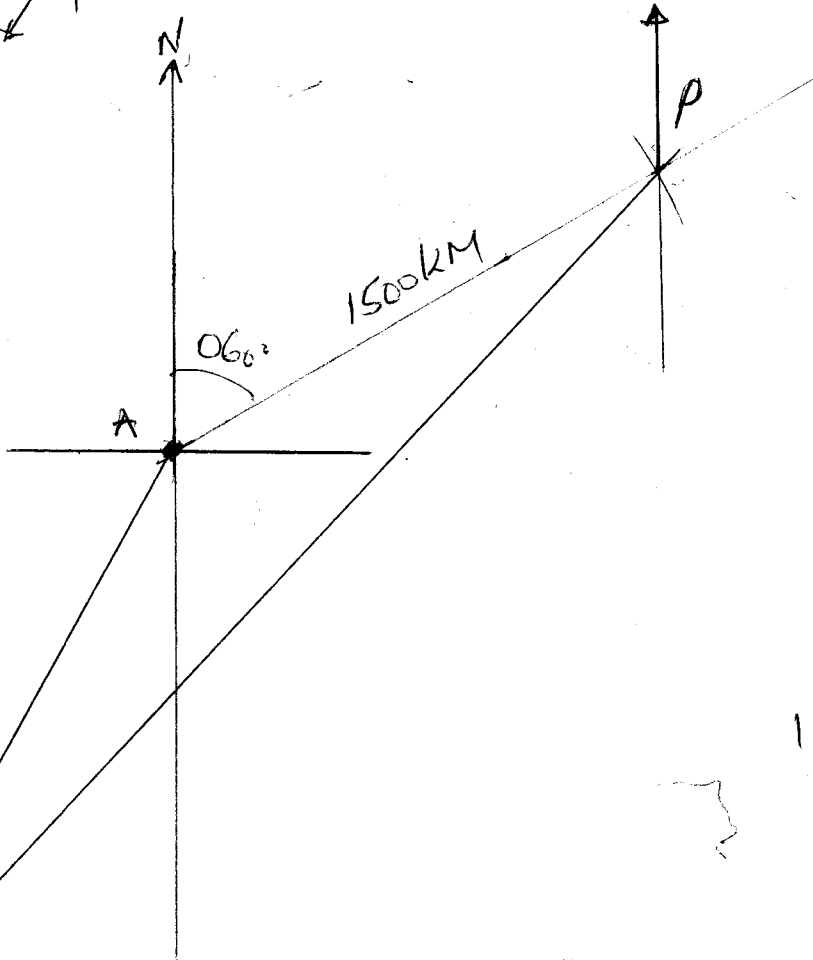
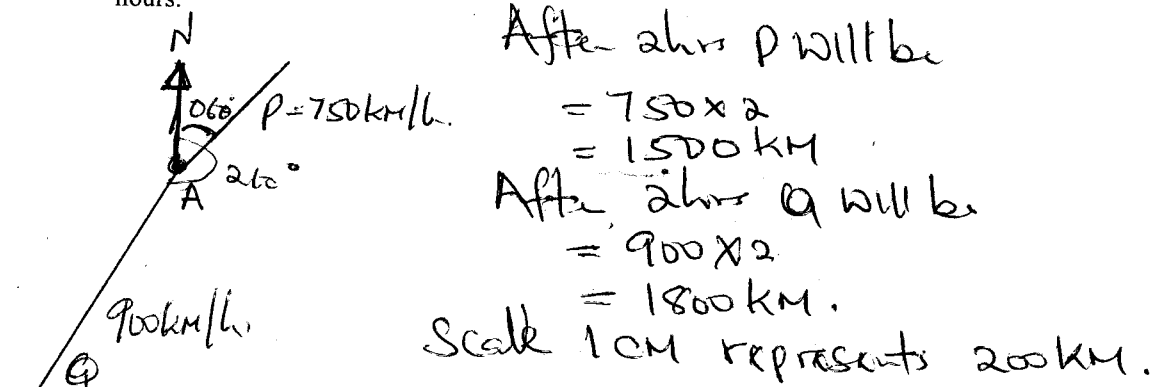
- 22 Using a ruler and a pair of compass only, construct a triangle ABC in which 3 mks
AB=7.5cm, BC=6cm and AC=4.5cm



- a) Measure:
 i) $\angle ABC \approx 36^\circ$ 3 mks
 ii) $\angle ACB \approx 90^\circ$
 iii) $\angle BAC \approx 54^\circ$
- b) Draw a circle enclosed within the sides of triangle ABC 3 mks
 c) What is the diameter of the circle? 1 mk

$$1.5 \text{ cm} + 1.5 \text{ cm} = 3 \text{ cm}$$

- 23 Two boats P and Q leave port A at the same time. P sails on a bearing of 060° at 750 km/h while Q sails on a bearing of 210° at 900 km/h .
- a) Using a suitable scale draw a diagram to show the positions of the boats after 2 hours. 4 mks



15.8 cm

1 cm \rightarrow 200 km

$$15.8 \text{ cm} \rightarrow \frac{15.8}{1} \times 200$$

$$= 3,160 \text{ km}$$

- b) Use your diagram to determine:
 i) the distance between the two boats in kilometers 2 mks

$$15.8 \text{ cm} = 3,160 \text{ km}$$

- ii) the bearing of Q from P 2 mks

$$180 + 44 = 224^\circ \pm 1$$

- iii) the bearing of P from Q 2 mks

$$= 43^\circ \pm 1$$

24 Given that points X (0,-2), Y (4, 2) and Z (x,6);

- a) Write down the column vector \overrightarrow{XY} . 1 mk

$$\overrightarrow{XY} = \begin{pmatrix} 4 \\ 2 \end{pmatrix} - \begin{pmatrix} 0 \\ -2 \end{pmatrix} = \begin{pmatrix} 4 \\ 4 \end{pmatrix}$$

- b) i) Find $|\overrightarrow{XY}|$ leaving your answer in index form. 3 mks

$$|\overrightarrow{XY}| = \sqrt{4^2 + 4^2} \\ = \sqrt{32} = \underline{\underline{5.66}}$$

- ii) Given that $|\overrightarrow{XZ}| = 11.3170$, find the coordinates of Z. 3 mks

$$|\overrightarrow{XZ}| = 11.3170$$

$$\overrightarrow{XZ} = Z - X$$

$$= \begin{pmatrix} x \\ 6 \end{pmatrix} - \begin{pmatrix} 0 \\ -2 \end{pmatrix} = \begin{pmatrix} x \\ 8 \end{pmatrix}$$

$$\overrightarrow{XZ} = x, 8 \text{ or } \begin{pmatrix} x \\ 8 \end{pmatrix}$$

$$|\overrightarrow{XZ}| = \sqrt{x^2 + 8^2} = 11.3170$$

$$x^2 + 8^2 = 11.3170^2$$

$$x^2 = 11.3170^2 - 64$$

$$= 128.07 - 64$$

$$= \sqrt{64.07}$$

$$x = 8.004$$

- c) Find the mid-point of the line YZ. 3 mks

$$\frac{x \text{ coord of } YZ}{2}, \frac{y \text{ coord of } YZ}{2}$$

$$\frac{5+4}{2}, \frac{10+2}{2}$$

$$= (4.5, 6)$$

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LINEAR

x	-6	-4	-2	0
y	-9	-6	-3	0

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

x	0	1	2	3
y	2	2.5	3	3.5

