# MATHEMATICS PP1, MOCK SERIES 1,

# K.C.S.E TOP EXAMINERS' 10 QUESTION PAPERS




## MATHEMATICS PP1, MOCK SERIES 1,
## K.C.S.E TOP EXAMINERS' 10 QP

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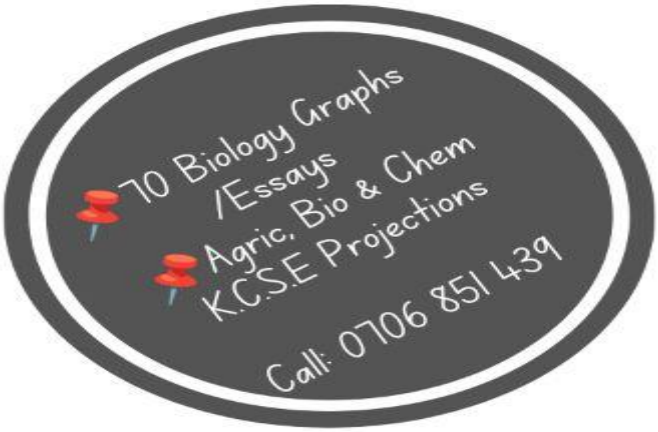




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# K.C.S.E TOP EXAMINERS' MOCK SERIES 1

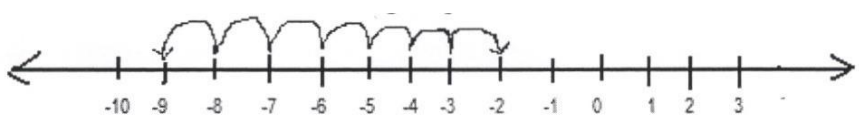
# QUESTION PAPER NO: 1

**121/1**
**MATHEMATICS**
**PAPER 1**
**TIME: 2 ½ HOURS.**

**SECTION 1 (50 MARKS)**

***Attempt all the questions***

**1.** The number line below shows an integer operation whose result is 7.




Write down the actual operation. **(l mk)**

**2.** Work out 18.5 x 7.698 leaving your answer in expanded form. **(2mks)**

**3.** What is the total value of digit six in the solution to 1725 -125 + 6591 ÷ 39 x 5 *of* 90? **(3mks)**

**4.** All composite numbers divisible by 3 between 10 and 30 are arranged in descending order to form a single natural number. Write down the number formed in words. **(3mks)**

**5.** If $\frac{x+3}{x-9}$ is the reciprocal of $\frac{x-4}{x+1}$, find the value of $x$. **(3mks)**

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**6.** Complete the shape below using the dotted centre to show a rotational symmetry of order 5 **2mks**

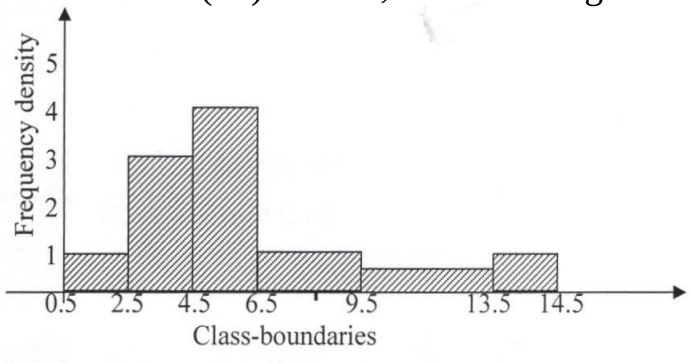


**7.** The lines $4ax = 3y + 12$ and $7bx - 2 = 3y$ are parallel. Find the ratio $a:b$ **(3mks)**

**8.** Simplify $\frac{(12-x-6x^2)(9x^2+16)}{81x^4-256}$ completely **(4mks)**

**9.** Solve for $x$ in $3^{-2x+1} - 10(3^{-x}) + 3 = 0$, without using tables. **(3mks)**

**10.**




Using the histogram shown above, complete the frequency table below. **(3mks)**

| Class boundary | Frequency |
|---|---|
| 0.5-2.5 | 2 |
| 2.5 – 4.5 | 6 |
| 4.5 - 6.5 | |
| 6.5 - 9.5 | |
| 9.5 – 13.5 | |
| 13.5 – 14.5 | |

**11.** Use the actual mean for the data below to calculate the standard deviation for the following scores. (4mks)

| Score | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| *f* | 1 | 2 | 2 | 2 | 5 | 2 |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**12.** A wire 180cm long was used to make a model of a triangular-based prism. The cross-section has sides of length 10cm each. Calculate the volume of the resulting shape. **(4mks)**

**13.** Given that $\frac{{}^{3}/_{5}\ of\ 60 - 2\ {}^{2}/_{3} \times 1\frac{1}{2}}{5^{5}/_{8} \times 1^{7}/_{9} - {}^{5}/_{4} of\ 4\ {}^{4}/_{5} + 2^{4}/_{5} \div {}^{7}/_{10}} = m^{m}$, find the value of m. **(3mks)**

**14.** Solve the following inequalities and show on a number line the region satisfying the values of $x$ for $\frac{x}{2} - 1 < \frac{x}{5}$ and $\frac{3}{8} + \frac{x}{3} \geq \frac{x}{4}$ **(4mks)**

**15.** For a given right-angled triangle ABC, Sin B =0.8. Use the single triangle to find $\text{Tan}^2$ (90-B) **(4mks)**

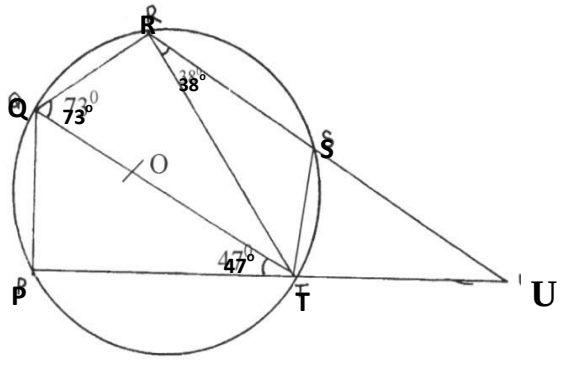
**16.** Use mathematical tables to evaluate. **(4mks)**

$$\sqrt{\left(\frac{\sqrt{3}\ \ 3.576\ 1}{3.18^2 + \sqrt{0.257}}\right)}$$

***Attempt <u>all</u> the questions***

**17.** In the figure below, QOT is a diameter, angle QTP = 47°, angle TQR = 73° and angle SRT = 38°.

Calculate giving reasons in each case:





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**a)** angle RST. **(l mk)**

**b)** angle SUT **(3mks)**

**c)** Obtuse angle ROT. **(2mks)**

**d)** angle PST **(2mks)**

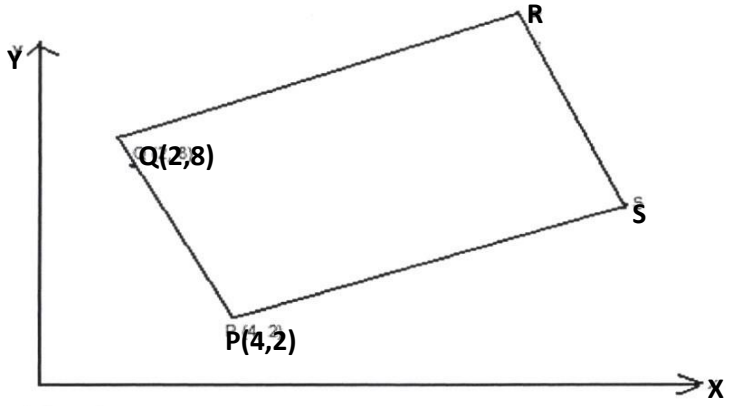
**e)** Reflex angle SOP **(2mks)**

**18.** (a) Use graphical method to solve the equations $x + 2y = 5$ and $3x - 2y = 7$ **(7mks)**

**(PROVIDE A GRAPH PAPER)**

(b) Verify your solutions by using matrix method. **(3mks)**

**19.** In the figure, PQRS is a rectangle with point P(4, 2) and Q (2, 8). Given that the equation of the line PR is $2y = 2x + 4$, find;




**a)** the equation of line QP **(2mks)**

**b)** the equation of line QR **(2mks)**

**c)** the co-ordinates of R **(3mks)**

**d)** the co-ordinates of S **(3mks)**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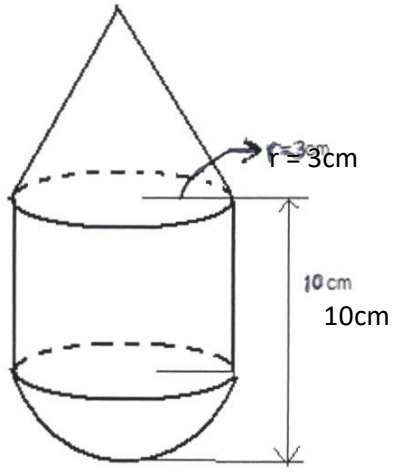
**20.** Draw a circle centre 0 and radius 4 cm. **(l mk)**

**a)** From any point A on the circumference, draw two chords AB = 7cm and AC = 7.5cm on the opposite sides of the centre. **(2mks)**

**b)** Join B to C and locate the orthocenter (H) of triangle ABC. Join OH. **(4mks)**

**c)** Use the midpoint of OH as the centre to inscribe a circle to triangle ABC and measure its radius. **(3mks)**

**21.** In the figure below, the top cone was formed from a sector of area 132 $cm^2$ (using $\pi = \frac{22}{7}$ )




Calculate:

**a)** The total surface area of the shape. **(6mks)**

**b)** The volume of the shape. **(4mks)**

**22.** At 2.00 pm, a ship is at a position P from where a light house L is 12km away on a bearing of 320º. At 4.00pm, the ship is at a position Q from where the lighthouse is now on a bearing of 035°. Given that the ship is traveling due West, find by calculation;

**a)** How far the lighthouse is from Q. **(3mks)**

**b)** The speed of the ship. **(2mks)**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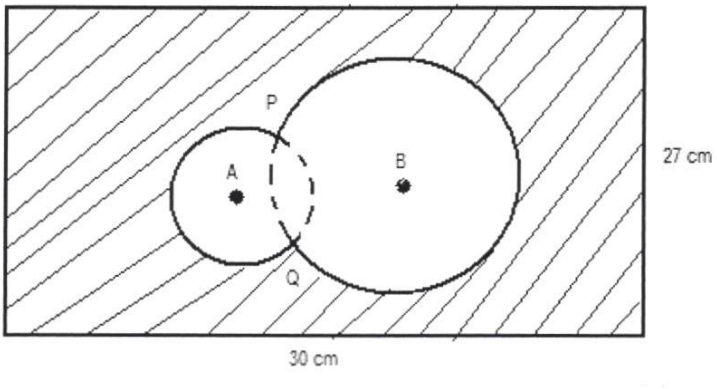
**c)** The closest distance of the ship from the light house. **(2mks)**

**d)** The lighthouse, point Q and point P were noted to be along the circumference of a circular field. Find the distance of P from the centre of the field. **(3mks)**

**23.** Calculate the shaded area in the figure below given that the circles of centres A and B have radius of 7cm and 10.5cm respectively intersecting at points P and Q with PQ = 6cm. **(l0mks)**




**24.** Triangle XYZ whose vertices are (3, -2), (-2,-3) and (1, -3) respectively is mapped on $X_1$ (5, -1), $Y_1$ (0, -2) $Z_1$ (3, -2) by transformation $T_1$. XYZ is mapped on to $X_2$ (-3,2), $Y_2$( 2,3), $Z_2$( -1,3) by transformation $T_2$. XYZ is mapped on to $X_3$ (-6, 4), $Y_3$(4, 6), $Z_3$(-2,6) by transformation T3.

**a)** Plot XYZ and its three images **(4mks)**

**b)** Describe fully each of the transformations $T_1$, $T_2$ and $T_3$. **(6mks)**

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# K.C.S.E TOP EXAMINERS' MOCK SERIES 1
# QUESTION PAPER NO: 2

**121/1**

**MATHEMATICS**

**PAPER 1**

**TIME: 2 ½ HOURS.**

***SECTION I***

***Answer <u>all</u> questions in this spaces provided.***

**1.** Use mathematical tables to evaluate

$$\frac{0.3}{0.0351} + \sqrt{0.498}$$ **(3mks)**

**2.** Express y in terms of x given that:-

$10x^2 - 9xy + 2y^2 = 0$ **(3mks)**

**3.** A circle of radius 4.9cm fits exactly inside a square. Find the area of the space between the circle and the square**.** **(2mks)**

**4.** Solve the simultaneous equations $xy = 4$

$x + y = 5$ **(4mks)**



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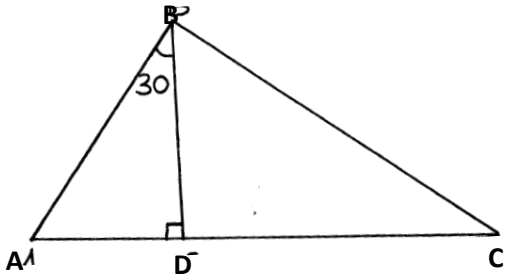
**5.** The table below shows the number of goals scored in 40 soccer matches during a certain season.

| No. of goals | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| No. of matches | 3 | 9 | 6 | 8 | 5 | 5 | 2 | 1 |

Calculate the mean number of goals scored per match. **(3mks)**

**6.** Find the length of AC in the fig. below. **(3mks)**




**7.** Given 2.421=2a/b. determine the values of a and b. **(3mks)**

**8.** The interior angles of a hexagon are 2x + 5, 4x - 5, 4x + 5, 3x, 4x - 20 and 2x. Find the value of x. **(3mks)**

**9.** Solve the following inequality and show your solution on a number line. **(5mks)**

$4x - 3 \leq \frac{1}{2}(x + 8) < x + 5$

**10.** Express the number 935 and 19845 as a product of their prime factors hence evaluate $\frac{935}{19845}$ leaving your answer in prime factor form. (3mks)

**11.** A surveyor finds that she needs 28 beacons placed 40m apart when she surveys the length of a road. If she were to place the beacons 30m apart, how many beacons would she need? (2mks)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**12.** A line passes through the point (-1, 2) and has gradient -½. Write down its equation in the form ax + by = c **(3mks)**

**14.** Last year Kulundu was four times as old as his daughter Amina. In four years time the sum of their ages will be 53. Determine their present ages. **(4mks)**

**15.** Solve the pair of simultaneous equations using elimination method.

$4x+9y=5$

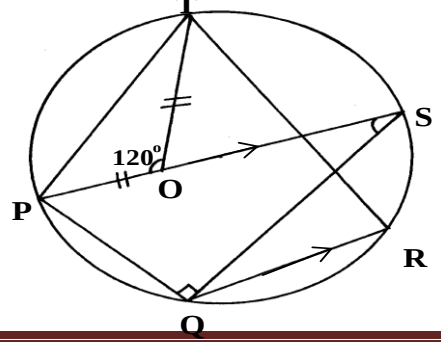
$3x+3y=2$ **(4mks)**

**16.** Agnes paid rent which was 1/10 of her net salary. She used ½ of the remaining amount to make a down payment for a plot. She gave her mother Kshs. 2,500 and did shopping worth Kshs. 7,500 for herself. She saved the remainder which was Ksh. 12,500. How much was the down payment that she made**.** **(5mks)**

## SECTION II (50 MARKS)

***Answer only <u>five</u> questions.***

**17.** In the figure below**, O** is the centre of the circle and PS is a diameter of the circle. **QR** is parallel to **PS**. If angle **PSQ**=25$^o$ and angle **POT**=120$^o$. Find the sizes of the given angles giving reasons for each.





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**(a)** angle **QRT (3mks)**

**(b)** angle **QPT (3mks)**

**(c)** angle **POR (3mks)**

**(d)** angle **PTR (2mks)**

**18.** A bus left Nairobi at 7.00 am and traveled towards Eldoret at an average speed of 80Km/hr. At 7.45 a.m a car left Eldoret towards Nairobi at an average speed of 120Km/hr. The distance between Nairobi and Eldoret is 300 km. Calculate:

**(a)** The time the bus arrived at Eldoret. **(2mks)**

**(b)** The time of the day the two met. **(4mks)**

**(c)** The distance of the bus from Eldoret when the car arrived in Nairobi. **(2mks)**

**(d)** The distance from Nairobi when the two met. **(2mks)**

**19.** A number of people are asked to cut 20cm lengths of string without measuring. Later 100 pieces are collected and measured correct to the nearest 1/10cm. the data below was collected.

| Length, L(cm) | 18.0-18.4 | 18.5-18.9 | 19.0-19.4 | 19.5-19.9 | 20.0-20.4 | 20.5-20.9 | 21.0-21.4 | 21.5-21.9 |
|---|---|---|---|---|---|---|---|---|
| Frequency | 5 | 8 | 30 | 13 | 10 | 20 | 10 | 4 |

Using 19.7 as a working mean calculate:

**(a)** Mean **(4mks)**

**(b)** Standard deviation **(5mks)**

**(c)** State the modal class **(1mk)**


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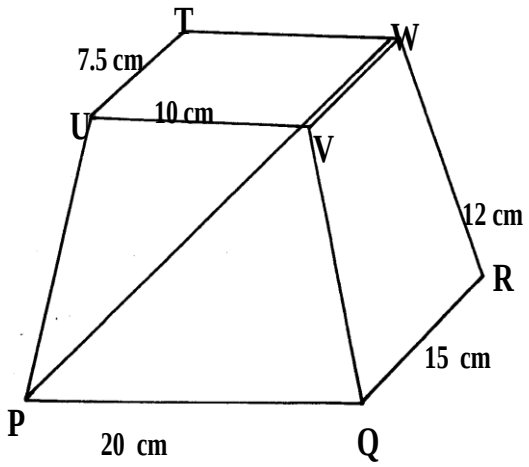
**20.** The figure below shows a frustrum **PQRSTUVW** of a right pyramid. **PQ** = 20cm, **QR** = 15cm, **UV** = 10cm, **UT** = 7.5cm and **PU** = **QV** = **RW** = **ST** = 12cm.




Leave all your answer to 4 s.f.

**(a)** Find the altitude of the pyramid from which the frustrum was cut. **(3mks)**

**(b)** Find the angle between

**(i)** PW and base PQRS

**(ii)** PQVU and the base PQRS **(3mks)**

**21.** Four points **B, C, Q** and **D** lie on the same plane. Point B is 42km due southwest point **Q**. Point **C** is 50 km on a bearing of S60$^{o}$E from **Q**. Point **D** is equidistant from **B, Q** and **C**.

**(a)** Using the scale: 1cm represents 10km, construct a diagram showing the positions of **B, C, Q** and **D.**

**(b)** Determine the

**(i)** distance between **B** and **C** **(1mk)**

**(ii)** bearing of **D** from **B** **(2mks)**

**(c)** Find the distance and bearing of **D** from **C**. **(2mks)**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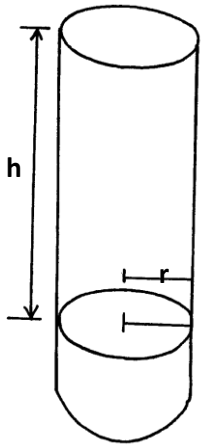
**22.** (a) A test-tube consist of a cylinder and a hemisphere of the same radius; 282 $cm^3$of water is required to fill the whole tube and 262$cm^3$ is required to fill it at a level of 1 $cm^3$ below the top of the tube.

Find the radius of the tube and the length of the cylindrical part. **(6mks)**




(b) A tank holding 1$m^3$ of water is filled in 10minutes by a circular pipe of diameter 2cm. Find the speed of water in the pipe. **(4mks)**

**23.** Three business partners: Asha, Nangila and Cherop contributed Kshs. 60,000, Kshs. 85,000 and Kshs. 105,000 respectively. They agreed to put 25% of the profit back into business each year. They also agreed to put aside 40% of the remaining profit to carter for taxes and insurance. The rest of the profit would be shared among the partners in the ratio of their contributions. At the end of the first year, the business realized a gross profit of Kshs. 225,000.

**(a)** Calculate the amount of money Cherop received more than Asha at the end of the first year.

**(5mks)**

**(b)** Nangila further invested Kshs. 25,000 into the business at the beginning of the second year. Given that the gross profit at the end of the second year increased in the ratio 10:9, calculate Nangila's share of the profit at the end of the second year. **(5mks)**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**24.** Complete the table below. (2mks) $y = 5 + 3x – 2x^2$

| x | -2 | -1.5 | -1 | -0.5 | 0 | 0.5 | 1 | 1.5 | 2 | 2.5 | 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| y | | | | | | | | | | | |

**(a)** Use the values in the table to draw the graph $y = 5 + 3x - 2x^2$. **(2mks)**

**(b)** Use suitable straight lines to graphically solve the equations.

(i) $0 = 2x^2 - 2x - 3$ **(3mks)**

(ii) $2x^2 = 2x$ **(2mks)**

**(c)** Identify the line of symmetry.


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**4.** During a methamatical experiment it was deviced that Tan $144^o = 1- \sqrt{3}$ determine the value of 54o from this results leaving your answer in the form $\frac{a+ \sqrt{c}}{B}$ where a, b and c are integers. **(4mks )**

**5.** Three traders Moses, Daniel and Thomas shatred a profit of sh. 620,000 Moses got 3 ½ times as much as Thomas. Find the amount of money each got. **(3mks)**

**6.** Judy needs to buy clothes cpsting sh. 324 each while Nyamboga needs to buy clothes costing shs. 220 each. Their father woulf like to give them equal amounts of money.

(a) What is the least amount of money that he can send to each of them so that the money is fully utilized, on clothes without remainder. **(2mks)**

(b) How many clothes will each buy? **(1mk)**

**7.** Find integral values stasisfying x the following inequalities.

$2x + 3 \geq 5x-3 > -1$ **(3mks)**

**8.** The interior angle of regular polygon is 20o more than three times the exterior angle.

Find the number of sides of the polygon. **(3mks)**

**9.** Simplify $\dfrac{(x-y)2 – ( x+ y)2}{(x2 + y2)\ 2 – ( x2 – y2)2}$ **(4mks)**

**10.** Find the surface area of the triangular prism sown below. **(3mks)**

**11.** Find the a cute angle x, given that Cos xo = Sin 2xo **(3mks)**

**12.** Tap A can fill a tank in 10 minutes, tap can fill the same in 30 minutes, the three taps are left open for 5 minutes, after which tap A is closed, how long does it take to fill the tank. **(3mks)**

**13.** Find the equation of the normal to the curve y = x3-2x – 1 **(3mks)**


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**14.** The ration of boys to girls in ratanga mixed secondary school is 4:5one day 1/3 of the boys and 1/5 of the girls were absent, ¾ of the 8 less pupils had been absent. Calculate the number of pupils in Ratanga on that day. **(3mks)**

**15.** Determine the equation of the mirror line given that a point Q (-2,4) is mapped onto Q1( 4,2) after a reflection. **(3mks)**

**16.** A line segement Ab+4cm long, construct the locus of a point P on the upper side of AB such that ∠APB = 60o **(4mks)**

## SECTION II

**17.** The figure below shows two circles with centres at P andQ and radii 8cm and 6 cm with centres P and Q respectively. The circles intersect at point A and B.

Diagram

Calculate

**(a)** The length of the common chord AB. **(3mks)**

**(b)** ∠ APB and ∠ AQB **(3mks)**

**(c)** the are of the sahded part. (4mks)

**18.** A lorry left town A at 8.30 am for town B aat an average speed of 70 km/hr. A matatu left town B at 9.00 am for town A at an average speed of 80km/hr. the towns are 180km apart.

**(a)** Calcualte the distance from town A when


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# K.C.S.E TOP EXAMINERS' MOCK SERIES 1
# QUESTION PAPER NO: 4

**121/1**

**MATHEMATICS**

**PAPER 1**

**TIME: 2 ½ HOURS.**

## SECTION I (50 MARKS)

**Answer all questions in this section in the spaces provided.**

**1.** Without using mathematical table of calculator, evaluate: (3mks)

$$\sqrt{\frac{\mathbf{0.38 \times 0.23 \times 2.7}}{0.114 \times 0.0575}}$$

**2.** Work out the following, giving your answer as a mixed number in its simplest form. **(3mks)**

$$\frac{2 \div 1 \text{ of } 4 - 11/10}{\mathbf{5 \quad 2 \quad 9}}$$
$$\frac{1}{8} - \frac{1}{16} \times \frac{3}{8}$$

**3.** Simplify the expression $\frac{3x^2 - 4xy + y^2}{9x^2 - y^2}$ **(3mks)**



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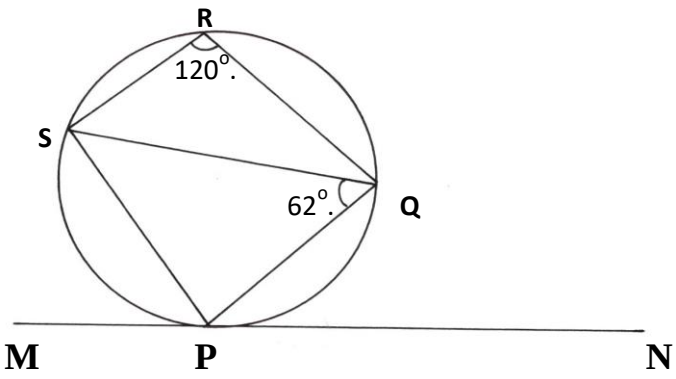
**4.** A prism of length 15cm has a uniform triangular cross section of sides measuring 8cm, 7cm and 5cm. determine the volume of the prism**.** **(4mks)**

**5.** The line passing through the points P(5, b), Q(2,3) is parallel to the line 2y=-x+2. determine the value of b**.** **(3mks)**

**6.** The sum of two numbers is 15. The difference between five times the first number and three times the second number is 19. Find the two numbers. **(4mks)**

**7.** In the figure below MPN is a tangent to the circle at P. Find ∠SPQ and ∠NPQ, stating your reasons. ∠SRQ=120$^o$ and ∠PQR=62$^o$. **(4mks)**




**8.** A sector of a circle of radius 10cm has an arc that subtends an angle of 270$^o$ at the centre.

Calculate the vertical height of the cone formed by the sector. **(3mks)**

**9.** Find the integral values of x which satisfy the simultaneous inequalities.

$3x-2<10+x<10+x$ **(4mks)**

**10.**The figure below shows the graph of velocity Vm/s against time t seconds of a car. If the car traveled a distance of 32 metres, in the first four seconds, calculate the average velocity for the whole journey**.** **(3mks)**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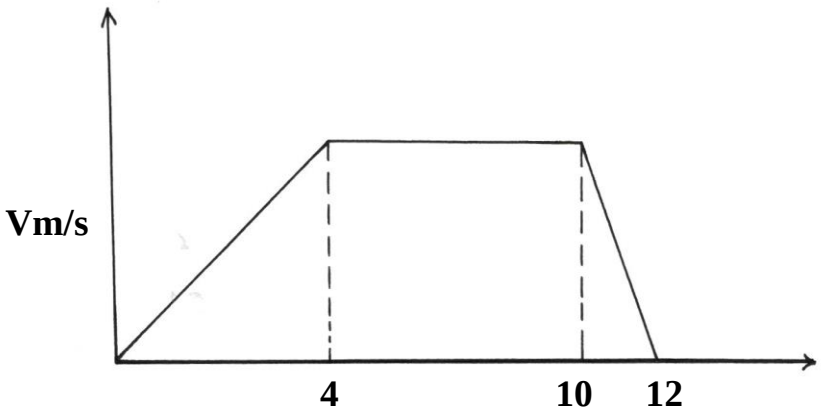


**11.** Show that the points P(3,4,7); Q(4,3,9) and R(1,6,3) are collinear. **(3mks)**

**12.** A milk vendor bought 20 litres of milk at Ksh.15 per litre and added 5 litres of water to the milk. If he sold the mixture at Ksh.18 per litre, what was the percentage profit. **(3mks)**

**13.** Each interior angle of n-sided polygon is $350^{o}$.

**(a)** Find n. **(2mks)**

**(b)** What is the name of the polygon? **(1mk)**

**14.** Solve the following equation for x without using tables or calculators. **(3mks)**

$$\left(\frac{6}{5}\right)^{x+1} = \left(\frac{125}{216}\right)^{2x+3}$$

**15.** Rono left Kenya for Ethiopia with Ksh. 16, 742, which he changed at the airport to Ethiopian Birr currency at the rate of Kshs.1=7.772 Birr. He spent 71,502.40 Birr and returned to Kenya with the balance that he changed back to Kenya shillings, at a new rate of Ksh. 1=8.211Birr. How much, to the nearest cents, in Kenya shillings did Rono get? **(2mks)**

**16.** The sides of a rectangle are increased by 10%. By what percentage is the area increased. **(2mks)**


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## SECTION II (50 MARKS)

***Answer only five questions in this section in the spaces provided.***

**17.** A racing cyclist completes the uphill section of mountainous course of 75km at an average speed of vkm/hr. He then returns downhill along the same route at an average speed of (V+20) km/hr.

**(a)** Write down in terms of v the time taken for;

**(i)** Uphill section **(1mk)**

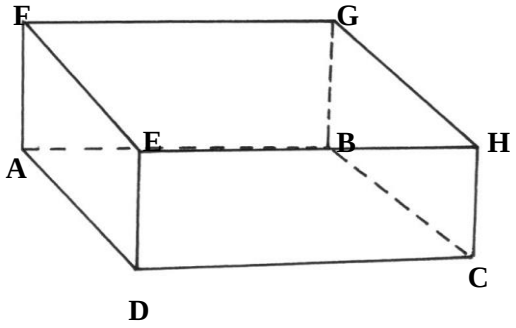
**(ii)** Return journey **(1mk)**

**(b)** Given that the difference between the time taken uphill is one hour, form an equation in V. **(1mk)**

**(c) (i)** Solve the above formed equation in (b) and calculate time taken to complete the uphill section of the course. **(4mks)**

**(ii)** Calculate the cyclist's average speed over 150km. **(3mks)**

**18.** Determine the distance between the following on the cuboid in the figure below.




**(a)** A and E **(2mks)**

**(b)** B and E over edge CD. **(4mks)**

**(c)** H and F over both edges BC and AB. **(2mks)**

**(d)** H and F over edges BC and AD. **(2mks)**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**19.** Five towns A,B,C,D and E are such that B is on a bearing of 040° and 6km from E. D is due west of E on a bearing of 340° from E. A is due North of E on a bearing of 045° from D. C is on a bearing of 250° from B and due North of E.

**(a)** Make a scale drawing showing the positions of the five towns.

(Use a scale of 1cm to represent 1km) **(5mks)**

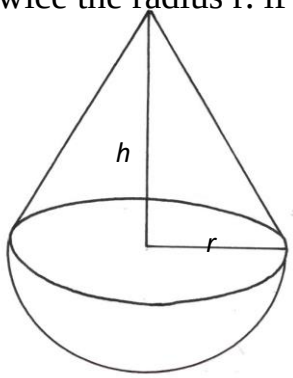
**(b)** Use your drawing to determine;

(i) the bearing and distance of B from A. **(2mks)**

(ii) the bearing and distance of C from D. **(2mks)**

(iii) the distance between A and E. **(1mk)**

**20. (a)** The figure below shows a metal solid consisting of a right cone mounted onto a hemisphere. The height h of the cone is twice the radius r. if the volume of the solid is 36cm$^3$, find the radius of the hemisphere. **(4mks)**




**(b)** The solid is totally immersed in water contained in a cylindrical tin of radius 9cm. through what height does the water level in the tin rise. **(2mks)**

**(c)** The solid is melted and recast into a right pyramid of vertical height 4.2cm. Find the base area of the pyramid. **(2mks)**

**(d)** If the solid is of mass 14.4g. Find its density in kg/m$^3$. **(2mks)**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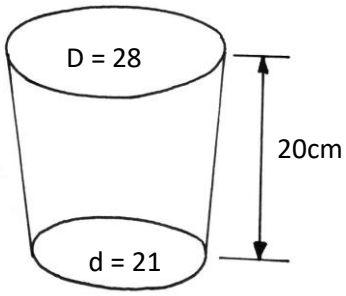
**21.** The diagram below shows a frustrum made by cutting of a small cone on a plane parallel to the base of the original cone. The frustrum represents a bucket with the open-end diameter of 28cm and the bottom diameter of 21. The bucket is 20cm deep. Calculate to 1 decimal place, the capacity of the bucket in litres**.** **(10mks)**




**22.** (a) On a squared paper draw the graph of $y=(1-2x)(x+4)$ for the range $-6<x<3$ **(4mks)**

**(b)** On the same grid draw the line $y=2-3x$. **(2mks)**

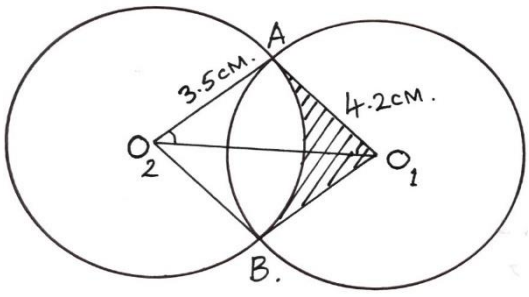
**(PROVIDE A GRAPH PAPER)**

**(c)** Use your graphs to solve the equations

(i) $(1-2x)(x+4)=-5$ **(2mks)**

(ii) $2-4x-2x^2=0$ **(2mks)**

**23.** Two circles of radii 3.5cm and 4.2cm with centres $O_1$ and $O_2$ respectively intersect at points A and B as shown in the figure below. The distance of the centres is 6cm.




Calculate

**(a)** $\angle AO_1B$ to the nearest degree **(3mks)**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**(b)** $\angle AO_2B$ to the nearest degree **(3mks)**

**(c)** Area of the quadrilateral $O_1AO_2B$, correct to 2 decimal places. **(2mks)**

**(d)** The shaded area correct to two significant figures.(Take $\pi = 22/7$)

24. A country bus left Nairobi at 10.45 and traveled towards Mombasa at an average speed of 60km/hr. A matatu left Nairobi at 1.15p.m on the same road at an average speed of 100km/hr. The distance between Nairobi and Mombasa is 500km.

**(a)** Determine the time of day when the matatu overtook the bus. **(6mks)**

**(b)** Both vehicles continue towards at their original speeds. Find how long the matatu had to wait in Mombasa before the bus arrived. **(4mks)**


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# K.C.S.E TOP EXAMINERS' MOCK SERIES 1
# QUESTION PAPER NO: 5

**121/1**

**MATHEMATICS**

**PAPER 1**

**TIME: 2 ½ HOURS.**

**SECTION I 50 MARKS**

**ANSWER ALL THE QUESTIONS IN THIS SECTION.**

**1.** Evaluate without using mathematical tables

$$\frac{1.9\times 0.032}{20\times 0.0038}$$ **(3mks)**

**2.** Use tables of reciprocals only to find the value of **(3mks)**

$$\frac{5}{0.0829} - \frac{14}{0.581}$$

**3.** You are given that $\cos\theta = \frac{8}{10}$. Without using mathematical tables express in fraction form the value of

**(a)** Sin θ

**(b)** tan (90 −θ) **(3mks)**

**4.** An open right circular cone has radius of 5cm and aperpendicular height of 12cm .Calculate the surface area of the cone.(Take πto be 3.14) **(3mks)**



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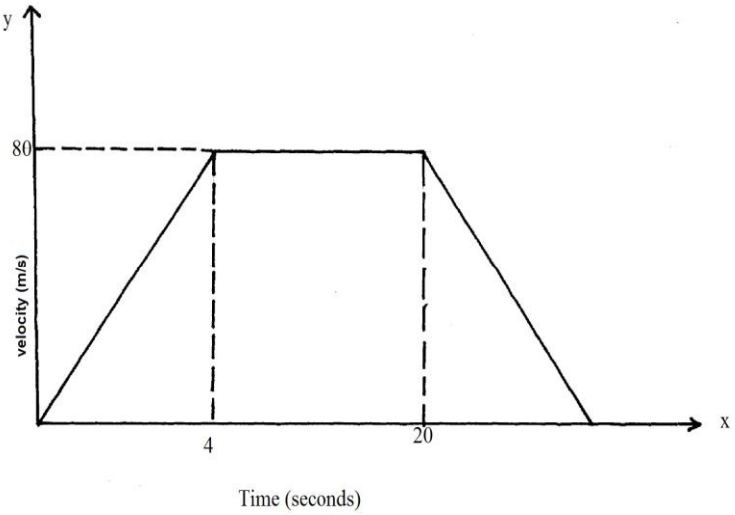
**5.** Nyongesa spends a total of sh.970 on buying 3 text books and 5 pens. If he had bought 2 text books and 5 pens he would have saved sh.90. Find the cost of one text book. **(3mks)**

**6.** The figure below is a velocity –time graph for a car




**(a)** Find the total distance traveled by the car? **(2mks)**

**(b)** Calculate the deceleration of the car. **(2mks)**

**7.** Three towns are situated in such a way that town B is 40km due south of town A and town C is 30 km due East of town B.

**(a)** Draw a sketch diagram showing the position of town A.B and C. **(1mk)**

**(b)** From your sketch, calculate:

**(i)** Distance AC **(1mk)**

**(ii)** T o the nearest degree the bearing of town A from town C. **(2mks)**

**8.** A Kenyan tourist left Germany for Kenya through Switzerland. While in Switzerland he bought a watch worth 52 Deutche marts. Find the value of the watch in;

**(a)** Swiss Franca **(2mks)**

**(b)** Kenya shillings using the exchange rates below,

1 swiss Franc = 1.28 DM and 1 Swiss Franc = 45.21 Kenya shillings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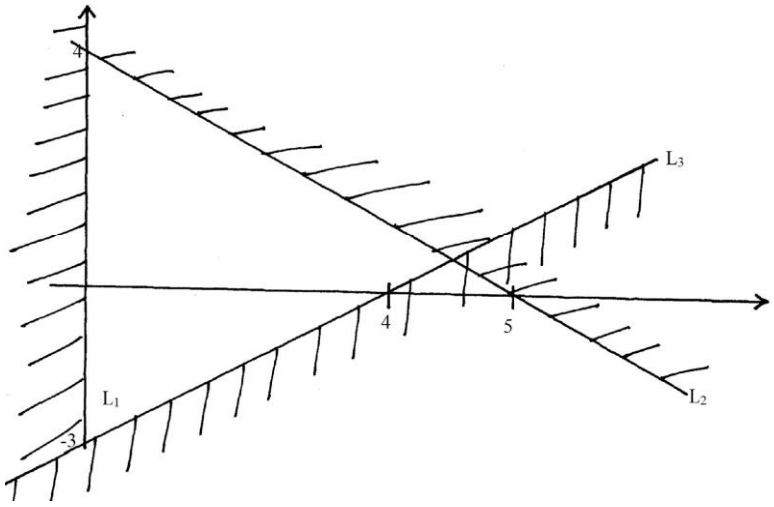
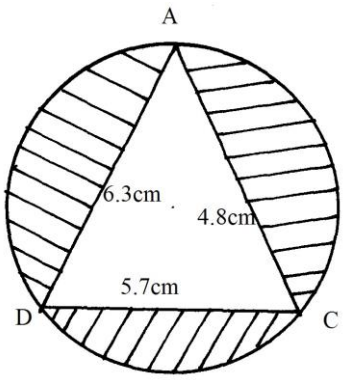
**9.** Find the inequalities that defines the region R shown in the figure below **(4mks)**




**10.** Form the quadratic equation whose roots are $x=-\frac{5}{3}$ and $x=1$ **(2mks)**

**11.** ABCD is a circle quadrilateral and AB is a diameter. Angle ADC=$117^0$. Giving reasons for each step, calculate the value of angle BAC. **(3mks)**

**12.** The circle below whose area is 18.05$cm^2$ circumscribes a triangle ABC where AB=6.3cm, BC =5.7cm and AC =4.8cm. Find the area of the shaded part. **(3mks)**




**13.** Solve for x in the equation

$9^{(x-1)} \times 3^{(2x+1)} = 243$ **(3mks)**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**14.** A form IV maths teacher originally worked out the mean mark of her 30 students to be 41. After the correction of the test, she added some marks of the test, she added some marks to Njoki, Chelimo and Nafula in the ratio 2:3:4,if the new mean mark for the class is 42.5 determine how many more marks Nafula was added than Chelimo. **(3mks)**

**15.** The volumes of two similar solid cylinders are 4752 $cm^3$ and 1408 $cm^3$.If the area of the curved surface of the smaller cylinder is 352 $cm^2$, find the area of the curved surface of the larger cylinder **(2mks)**

**16.** The line which joins the point A (3, K) and B (-2, 5) is parallel to the line whose equation is 5y+2x-7=0. Find the value of K. **(3mks)**

## SECTION II (50 MARKS)

## Attempt only FIVE questions in this section

**17.**A newly built classroom measuring 6m long 4.5m wide and 3.2 m high is to be cemented on the floor and all inside walls. The classroom has one door measuring 1.85m by 80cm by 80cm and four windows measuring 1.5m by 70cm each.Cementing materials cost 500 per square meter while labour costs 20% of the cost of cementing materials.

Calculate:

**(a)** To one decimal place, the total surface are to be cemented **(5mks)**

**(b)** The cost of cementing materials **(2mks)**

**(c)** The total cost of cementing the classroom **(3mks)**

**18.** If $x^2+y^2=29$ and $x+y=3$

**(a)** Determine the values of

**(i)** $x^2+2xy+y^2$ **(2mks)**

**(ii)** $2xy$ **(2mks)**

**(iii)** $x^2-2xy+y^2$ **(2mks)**

**(iv)** $x-y$ (2mks)


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**(b)** Find the value of x and y **(2mks)**

**19.** A country bus left town A at 11.45 am and traveled towards town B at an average speed of 60km/h.A matatu left town B at 1.15 pm. On the same day and traveled towards town A along the same road at an average speed of 90km/h. the distance between the two towns is 540km.

Determine

**(a)** The time of day when the two vehicles met **(4mks)**

**(b)** How far from town A they met **(2mks)**

**(c)** How far outside town B the bus was when the matatu reached town A **(4mks)**

**20.** The table below shows the names of 200 persons measured to the nearest kg

| Mass (kg) | 40-49 | 50-59 | 60-69 | 70-79 | 80-89 | 90-99 | 100-109 |
|---|---|---|---|---|---|---|---|
| No. of persons | 9 | 27 | 70 | 50 | 26 | 12 | 6 |

(a) Calculate the mean mass **(5mks)**

(b) Calculate the median mass **(5mks)**


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**21.** (a) Complete the table below by filling in the blank spaces

| $X^0$ | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 | 360 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Cos x | 1.00 | | 0.5 | | | -0.87 | | -0.87 | | | | | |
| 2 cos ½ x | 2.00 | 1.93 | | | | 0.52 | | | -1.00 | | | | -2.00 |

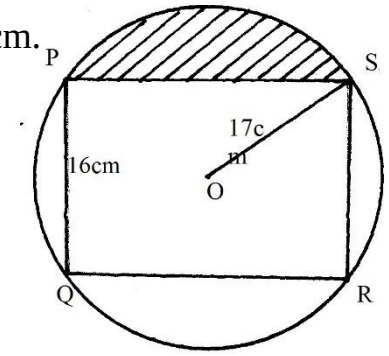
Using the scale km to represent 300 on the horizontal axis and 4cm represent 1 unit on the vertical axis, draw on the grid provided the graphs of y=cos x and y=2 cos ½ x **(4mks)**

**(b)** Find the period and amplitude of y=2 cos ½ x **(2mks)**

**(c)** Describe the transformation that maps the graph of y=cos x on the graph of y=2 cos ½ x

**(2mks)**

**22.** The figure below represent a rectangle PQRS inscribed in a circle centre O and radius 17cm. PQ =16cm.




Calculate

**(a)** The length PS of the rectangle **(2mks)**

**(b)** The angle ROS **(4mks)**

**(c)** The area of the shaded region **(4mks)**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**23.** (a) (i) Complete the table below for the function $Y=x^3+x^2-2x$ **(2mks)**

| X | -3 | -2 | -1 | 0 | 1 | 2 | 2.5 |
|---|---|---|---|---|---|---|---|
| -2x | 6 | 4 | 2 | 0 | -2 | -4 | -5 |
| $X^2$ | 9 | 4 | 1 | 0 | 1 | 4 | 6.25 |
| $X^3$ | -27 | -8 | -1 | 0 | 1 | 8 | 15.625 |
| $Y=x^3+x^2-2x$ | | | | | | | |

**(ii)** On the grid provided, draw the graph of $y=x^3+x^2-2x$ for the values of x in the interval $-3\leq x\therefore\leq 2.5$ **(4mks)**

**(iii)** State the range of negative value of x for which y is also negative **(1mk)**

**(b)** Find the coordinates of two points on the curve other than (0,0) at which x-coordinate and y-coordinate are equal. **(3mks)**

**24.** Use a ruler ad a compass only for all constructions in this section.

**(a)** Construct a triangle XYZ in which XY =6cm YZ =5cm and angle $XYZ=120^0$. **(2mks)**

**(b)** Measure XZ and angle YXZ. **(4mks)**

**(c)** Construct the perpendicular bisector of XZ and let it meet XZ at M **(1mk)**

**(d)** Locate a point W on the opposite side of XZ as Y and that XW =ZW and YW=9cm and hence complete triangle XZW. **(3mks)**


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# K.C.S.E TOP EXAMINERS' MOCK SERIES 1
# QUESTION PAPER NO: 6

**121/1**

**MATHEMATICS**

**PAPER 1**

**TIME: 2 ½ HOURS.**

**SECTION I: (50 MARKS)**

**Answer all the question in this section in the spaces provided:**

**1.** Evaluate without using a calculator or Mathematical tables leaving your answer in the simplest form.

$$\frac{\frac{4}{11} of \left(\frac{3}{4}-\frac{1}{20}\right)}{\left(3+\frac{1}{3}\right) \div \left(1+\frac{1}{10}\right)}$$ **(2 marks)**

**2.** Three similar 21 inch television sets and five similar 17 inch television cost Ksh.129,250. The difference between the cost of two 21 inch television sets and four 17 inch television sets is Ksh.22,000. Calculate the price of a 21- inch television set and that of 17-inch television set. **(3 marks)**

**3.** Find the value of $\chi$ which satisfies the equation.

$16^{\chi^2} = 8^{4\chi - 3}$ **(3 marks)**



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**4.** A Kenya bank buys and sells foreign currencies as shown.

| | **Buying (Ksh)** | **Selling (Ksh)** |
|---|---|---|
| 1 Euro | 84.15 | 84.26 |
| 100 Japanese Yen | 65.37 | 65.45 |

A Japanese traveling from France to Kenya had 5000 Euros. He converted all the 5000 Euros to Kenya shilling at the bank. While in Kenya, he spent a total of Ksh.289850 and then converted the remaining Kenya shilling to Japanese Yens at the bank. Calculate the amount in Japanese Yen that he received. **(3 marks)**

**5.** Use tables of cubes, square roots and reciprocals to evaluate.

$$\frac{3}{(0.3375)^3 - \sqrt{337.5}}$$ **(4 marks)**

**6.** Line $L_1$ passes through the points (1, -2) and (3, -4). Find the equation of line $L_2$ which is a perpendicular bisector of $L_1$ leaving the answer in the form $a\chi + by + c = 0$. **(4 marks)**

**7.** Fifteen men working eight hours a day can complete a certain job in exactly 24 days. For how many hours a day must sixteen men work in order to complete the same job in exactly 20 days. **(2 marks)**

**8.** The curved surface area of a cylindrical container is 1980cm². If the radius of the container is 21cm, calculate to one decimal place the capacity of the container in litres (Take $\pi = \frac{22}{7}$ ). **(4 marks)**


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**9.** Calculate the value of $\int_{-2}^{2}\left(\frac{3\chi^2 + 2\chi^3}{\chi^2}\right)d\chi$. **(4 marks)**

**10.** The following were marks scored by a student in eight subjects: 36, 22, 48, 56, 32, 50, 43, 51.

Find the quartile deviation. **(3 marks)**

**11.** State all the integral values of **a** which satisfy the inequality.

$\frac{3a + 2}{4} \leq \frac{2a + 3}{5} \leq \frac{4a + 15}{6}$ **(3 marks)**

**12.** The coordinates of P and Q are P(5, 1) and Q(11, 4) point M divides line PQ in the ratio 2 : 1.

Find the magnitude of vector OM. (3 marks)

**13.(a)**Using a pair of compasses and a ruler only construct a triangle ABC such that AB = 6cm, BC = 8cm and $\angle$ABC = 135°. **(2 marks)**

**(b)** Construct the height of triangle ABC in (a) above taking BC as the base and measure the height. **(2 marks)**

**14.** One interior angle of a polygon is equal to 80° and each of the other interior angles are 128°.

Find the number of sides of the polygon. **(3 marks)**

**15.** The sum of the first 16 terms of an A.P is 2000. The sum of the next four terms is 900.

Calculate the first term and the common difference. **(3 marks)**

**16.** Solve the equation: $\text{Sin } \frac{5}{2}\theta = \frac{1}{2}$ for $0° \leq \theta \leq 180°$. **(3 marks)**


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## SECTION II: (50 MARKS)

Attempt **ONLY FIVE** questions from this section.

**17. (a)** A matatu traveling at 99km/hr passes a checkpoint at 9.00am. A police patrol car traveling at 132km/hr in the same direction passes through the police check point at 9.15am. If the matatu and the police patrol car continue at their uniform speeds, calculate at what time the police car will overtake the matatu. **(6 marks)**

(b) Two passenger trains A and B which are 240m apart and travelling at 164km/h and 88km/h respectively approach one another on a straight railway line. Train A is 150 metres long and train B is 100m long. Determine the time in seconds that elapses before the two trains completely pass each other. **(4 marks)**

**18. a)** Complete the table **below** for $y = 2\chi^3 + \chi^2 - 5\chi + 2$ for the interval $-3 \leq \chi \leq 3$. **(2 marks)**

| $\chi$ | -3 | -2 | -1 | 0 | 0.5 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|
| $2\chi^3$ | -54 | | -2 | | 0.25 | | 16 | |
| $\chi^2$ | 9 | 4 | | | 0.25 | 1 | | |
| $-5\chi$ | | | 5 | 0 | -2.5 | -5 | -10 | |
| +2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| y | | | 6 | | 0 | | | 50 |

**(b)** Draw the graph of $y = 2\chi^3 + \chi^2 - 5\chi + 2$ for the interval $-3 \leq \chi \leq 3$. **(3 marks)**

**(PROVIDE A GRAPH PAPER)**

**(c)** Use your graph to solve equation $y = 2\chi^3 + \chi^2 - 5\chi + 2$. **(1 mark)**

**(d)** Use your graph to solve equation $y = 2\chi^3 + \chi^2 - 11\chi - 10$. **(2 marks)**

**(e)** Find the gradient of the curve at $\chi = 2$. **(2 marks)**


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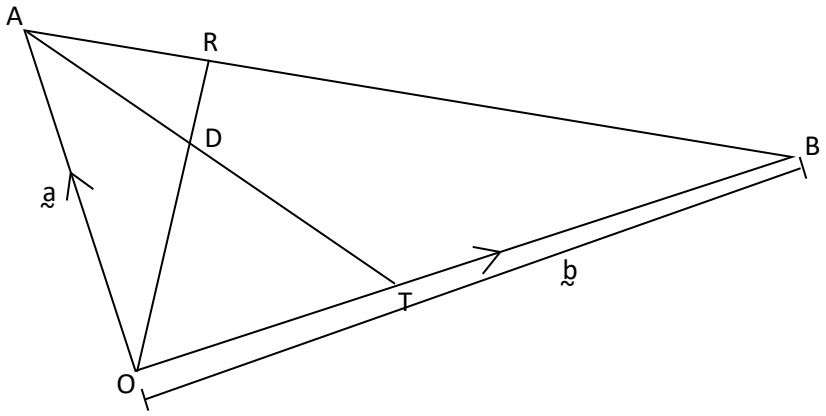
19. The figure **below** is a triangle OAB where $\overrightarrow{OA} = \underset{\sim}{a}$ and $\overrightarrow{OB} = \underset{\sim}{b}$. A point R divides AB in the ratio

2: 5 and a point T divides OB in the ratio 1: 3. $\overrightarrow{OR}$ and $\overrightarrow{AT}$ intersect at D.




**(a)** Find in terms of $\underset{\sim}{a}$ and $\underset{\sim}{b}$.

(a) $\overrightarrow{BT}$. **(1 mark)**

(ii) $\overrightarrow{OR}$ **(2 marks)**

(iii) $\overrightarrow{AT}$ **(2 marks)**

**(b)** Given that $\underset{\sim}{AD} = K\underset{\sim}{AT}$ and $\underset{\sim}{RD} = h\underset{\sim}{RO}$ where K and h are scalars. Find the values of K and h. Hence express AD in term of a and b. **(5 marks)**

**20.** The following measurements were recorded in a field book using XY as the base line. XY = 400m.

| | | | | |
|---|---|---|---|---|
| | | **Y** | | |
| **C** | **60** | **340** | | |
| | | **300** | **120** | **D** |
| | | **240** | **160** | **E** |
| | | **220** | **160** | **F** |
| **B** | **100** | **140** | | |
| **A** | **120** | **80** | | |
| | | **X** | | |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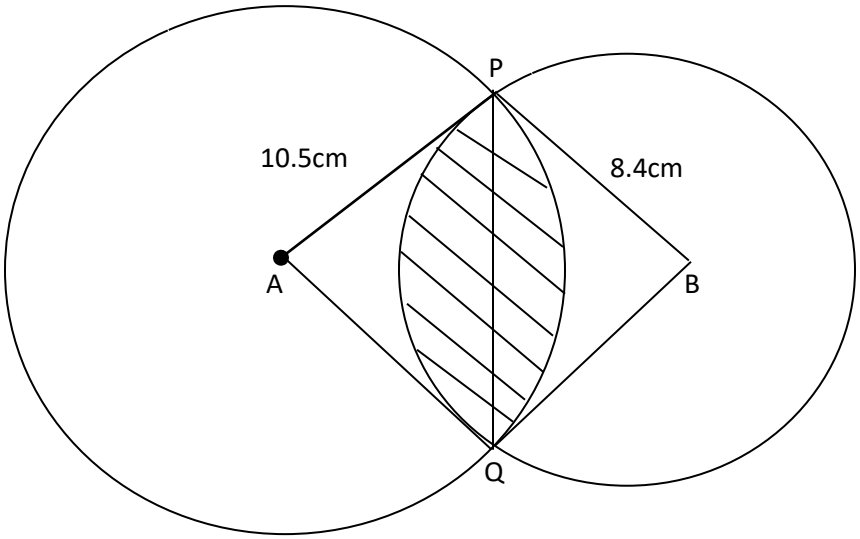
**(a)** Using a scale of 1: 4000, draw an accurate map of the farm. **(4 marks)**

**(b)** Determine the actual area of the farm in hectares. **(4 marks)**

**(c)** If the farm is on sale at sh.80000 per hectare, find how much the farm costs. **(2 marks)**

**21.** The figure **below** shows two circles of radii 10.5 and 8.4cm and with centres A and B respectively. The common chord PQ = 9cm.




**(a)** Calculate angle PAQ. **(2 marks)**

**(b)** Calculate angle PBQ. **(2 marks)**

**(c)** Calculate the area of the shaded part. **(6 marks)**

**22.** (a) A curve whose equation is in the form $y = m\chi^3 - n\chi$ where m and n are constants passes through the point (1, 2). Its gradient at the given point is 10. Find the values of m and n. **(3 marks)**

(b) Use the trapezium rule to find the area bounded by the curve $y = \chi^2 + 4$, the $\chi$-axis and the lines $\chi = 0$ and $\chi = 4$. Use five ordinates. **(3 marks)**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**(c)** Calculate the exact area bounded by the curve, $y = \chi^2 + 4$, the $\chi$-axis and the lines $\chi = 0$ and $\chi = 4$. Hence find the percentage error in (b) above. **(4 marks)**

**23.** The vertices of triangle PQR are P(0,0), Q(6, 0) and R(2, 4)

**(a)** Draw triangle PQR on the grid provided. **(1 mark)**

**(PROVIDE A GRAPH PAPER)**

**(b)** Triangle $P^1Q^1R^1$ is the image of a triangle PQR under an enlargement scale factor $\frac{1}{2}$ and centre (2, 2). Write down the coordinates of triangle $P^1Q^1R^1$ and plot on the same grid**. (2 marks)**

**(c)** Draw triangle $P^{11}Q^{11}R^{11}$ the image of triangle $P^1Q^1R^1$ under a positive quarter turn about points (1, 1). **(3 marks)**

**(d)** Draw a triangle $P^{111}Q^{111}R^{111}$ the image of triangle $P^{11}Q^{11}R^{11}$ under reflection in the line $y = 1$. **(2 marks)**

**(e)** Describe fully a single transformation triangle $P^{111}Q^{111}R^{111}$ onto triangle $P^1Q^1R^1$. **(2 marks)**

24. The taxation rates for income earned in a certain year were as follows.

| **Income** | **Tax Rate** |
|---|---|
| **K£ p.a** | **Ksh. per £** |
| **1 - 4512** | **2** |
| **4513 - 9024** | **3** |
| **9025 - 13536** | **4** |
| **13537 - 18048** | **5** |
| **18049 - 22560** | **6** |
| **Over 22560** | **6.5** |


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After a personal relief of Ksh.1056 per month Mrs. Wanjiru Njau paid tax amounting to Ksh.18152 that year.

**(a)** How much tax would she have paid if she did not have the personal relief. **(2 marks)**

**(b)** Find her taxable income in K£ that year. **(5 marks)**

**(c)** If Mrs. Wanjiru Njau receives allowances amounting to 18% of the taxable income, calculate his monthly basic salary to the nearest. **(3 marks)**


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**NAME: ……..……..……..

**5.** (a) Express 1050 in terms of its prime factors. **(1 mark)**

(b) Determine the smallest positive number such that 1050p is a perfect square. **(2 marks)**

**6.** The exterior angle of a regular polygon is $(\chi - 50)°$ and the interior angle is $(2\chi + 20)°$. Find the number of sides of the polygon. **(3 marks)**

**7.** A line P passes through the point (-2, 5) and has a gradient of $\frac{-3}{4}$. Another line Q is perpendicular to P and meets it at a point where $y = \frac{1}{2}$ find equation of Q.(4 marks)

**8.** Simplify the expression completely.

$$\frac{(\chi + 2y)(\chi - 2y) - (\chi - 2y)^2}{\chi^2 - 4y^2}$$ **(3 marks)**

**9.** The mass of two similar solid are 324g and 768g. Find

**(a)** height of the smaller solid if the height of the bigger solid is 20cm. **(2 marks)**

**(b)** the surface area of the smaller solid if the surface area of the bigger solid is 40cm². **(2 marks)**

10. A cylindrical pipe 5 metres long has an internal diameter 28 millimetres and an external diameter of 42 millimetres. The density of the material that makes the pipe is 1.45g/cm³. Calculate the mass of the pipe in kilograms. $\left(Take\ \pi = \frac{22}{7}\right)$. **(4 marks)**

11. Simplify: $\frac{32^{\frac{-1}{5}} \times 8100^{\frac{3}{4}}}{8^{\frac{-1}{2}} \times 5^{\frac{1}{2}} \times 4^{o} \times 4^{\frac{1}{4}}}$. **(3 marks)**


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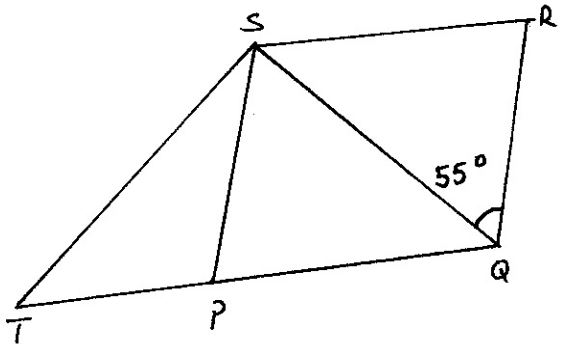
**12.** In the figure below PQRS is a rhombus, ∠SQR = 55°, ∠QST is a right angle and TPQ is a straight line.

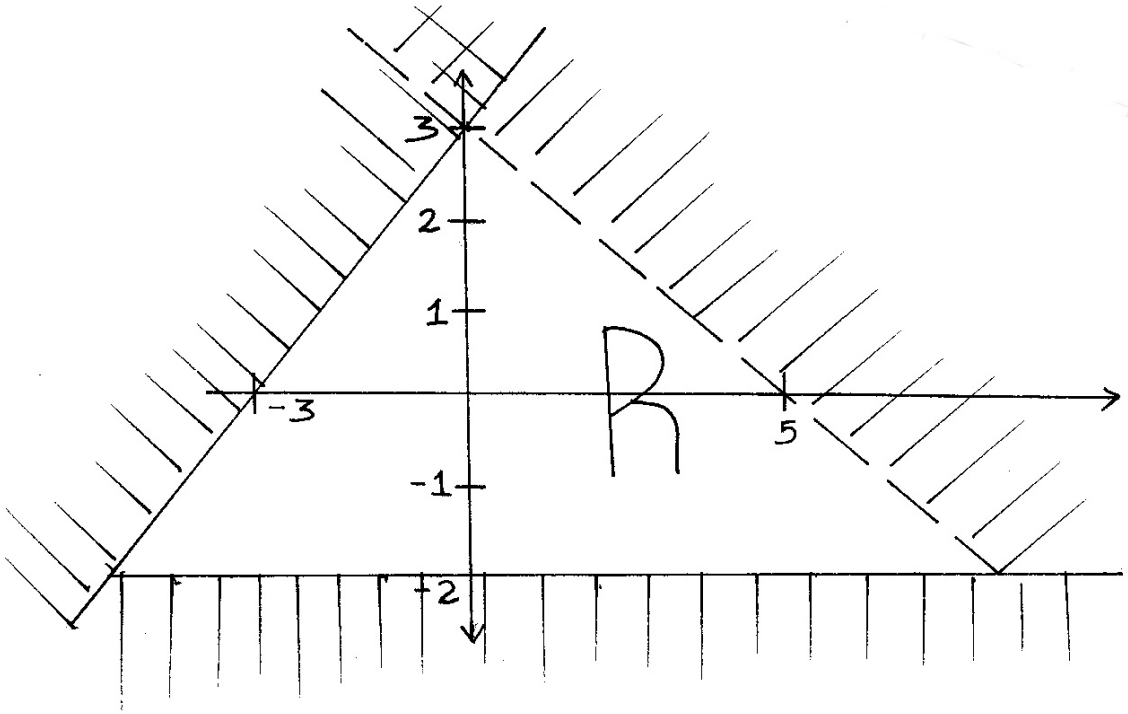



Find the size of the angle STQ. **(3 marks)**

**13.** The mass of a mixture A of beans and maize is 72kg. The ratio of beans to maize is 3: 5 respectively. Find the mass of maize in the mixture. **(3 marks)**

**14.** A square toilet is covered by a number of whole rectangular tiles of sides 60cm by 48cm. Calculate the least possible area of the room in square metres. (3 marks)

**15.** Form the inequalities represented by region R.





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16. A point C is on a line PQ where PQ = 9cm. C divides PQ such that $PC = \frac{4}{7}PQ$.

By construction locate C. **(3 marks)**

## SECTION B: (50 MARKS)

**Answer any FIVE questions from this section in the spaces provided.**

**17.** A construction company requires to transport 288 tonnes of stones to sites P and Q. The company pays 48,000 to transport 48 tonnes of stones for every 28km. Joyce transported 96 tonnes to site P, 49km away.

**(a)** Find how much she was paid. **(3 marks)**

**(b)** Joyce spends Ksh.6000 to transport every 8 tonnes of stones to site P. Calculate her total profit. **(3 marks)**

**(c)** Kimani transported the remaining stones to site Q, 84km away. If he made 44% profit, find his transport cost. **(4 marks)**

**18.(a)** A square carpet is laid on the floor of a room so that one of its sides is against a side of a room. If leaves strips of uncovered floor 1m wide along the two opposite sides and 2m wide along the remaining side. If the area of the room is 64m², find the dimensions of the carpet. **(6 marks)**

**(b)** Solve the equation: $\frac{y+3}{24} = \frac{1}{y-2}$. **(4 marks)**


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**19.** A trader bought 8 cows and 12 goats for a total of Ksh.294,000. If he had bought 1 more cows and 3 more goats he would have spend Ksh.337,500.

**(a)** Form two equations to represent the above information. **(2 marks)**

**(b)** Use matrix method to determine the cost of a cow and that of a goat. **(4 marks)**

**(d)** The trader sold the animals he had bought making a profit of 40% per low and 45% per goat.

**(i)** Calculate the total amount of money he received. **(2 marks)**

**(ii)** Determine his profit in Kenya shillings. **(2 marks)**

**20.** A truck left town X at 11.45am and travelled towards town Y at an average speed of 60km/hr. A car left town X at 2.15pm on the same day and travelled along the same road at an average speed of 100km/hr. The distance between the two towns is 500km.

**(a)** Calculate the time of the day when the car overtook the truck. **(4 marks)**

**(b)** The distance from Y when the car overtook the truck. **(3 marks)**

**(c)** After overtaking the bus, both vehicles continued towards Y at their original speeds.

Find how long the car had to wait at town Y before the truck arrived. **(3 marks)**

**21.** The displacement S metres of a moving particle after t seconds is given by

$S = 2t^3 - 5t^2 + 4t + 2$

Determine

**(a)** the velocity of the particle when t = 2. **(3 marks)**

**(b)** the value(s) of t when the particle is momentarily at rest. **(3 marks)**

**(c)** the displacement when the particle is momentarily at rest. **(2 marks)**

**(d)** the acceleration of the particle when t = 5. **(2 marks)**


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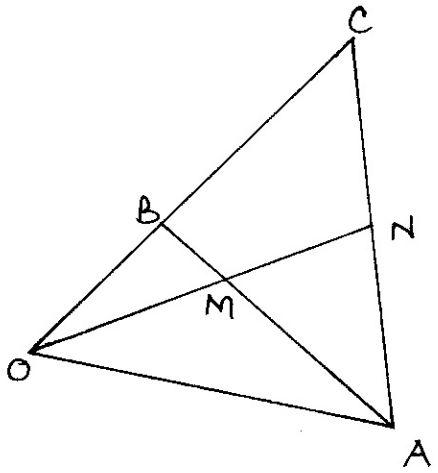
**22.** In the figure below, OA = a, OB = b and QC = 3QB.




**(a)** Express in terms of a and b.

(i) AB **(1 mark)**

(ii) AC **(1 mark)**

(b) Given that AM = $\frac{3}{4}$AB and AN = $\frac{1}{2}$AC, express OM and ON in terms of a and b. **(4 marks)**

**(c)** Hence show that O, M and N are collinear. **(4 marks)**

**23.** Triangle ABC has vertices A (1, 2), B (2, 3) and C (4, 1) while triangle $A^1B^1C^1$ has vertices $A^1(1, -2)$, $B^1(2, -3)$ and $C^1(4, -1)$.

**(a)** Draw triangle ABC and $A^1B^1C^1$ on the same grid. **(2 marks)**

**(b)** Describe fully a single transformation that maps triangle ABC onto triangle $A^1B^1C^1$. **(2 marks)**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**(c)** On the same grid draw triangle $A^{11}B^{11}C^{11}$ the image of triangle ABC under a reflection in line $Y = -\chi$. **(2 marks)**

**(d)** Draw $\Delta A^{111}B^{111}C^{111}$ such that it can be mapped onto triangle ABC by a negative quarter turn about the origin. **(2 marks)**

**(e)** Find the matrix of transformation that maps triangle ABC onto triangle $A^{111}B^{111}C^{111}$. **(2 marks)**

**(PROVIDE AGRAPH PAPER)**

**24.** Arc of a circle of radius 40cm subtends an angle of 126° at the centre of the circle.

(a) Calculate:

(i) the length of the arc. **(2 marks)**

(ii) the area of the sector. **(2 marks)**

**(b)** The sector is folded to form a cone.

Calculate:

**(i)** the radius of the base of the cone. **(2 marks)**

**(ii)** the height of the cone. **(2 marks)**

**(iii)** the capacity of the cone in litres. (2 marks)


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# K.C.S.E TOP EXAMINERS' MOCK SERIES 1
# QUESTION PAPER NO: 8

**121/1**

**MATHEMATICS**

**PAPER 1**

**TIME: 2 ½ HOURS.**

**SECTION I (50 MARKS)**

**1.** Without using tables or calculators, evaluate **(3mks)**

$$\sqrt{\frac{0.38\times 0.23\times 2.7}{0.114\times 0.0575}}$$

**2.** A line which joins the points A(3,K) and B(-2,5) is perpendicular to the line 5y+2x = 10. Find the value of K. **(3mks)**

**3.** The exterior angle of a regular polygon is equal to one –third of the interior angle. Calculate the number of sides of the polygon. **(3mks)**

**4.** A Kenyan bank buys and sells foreign currencies at the exchange rates below.

| | Buying | Selling |
|---|---|---|
| 1 Euro | Sh . 147.56 | Sh. 148.00 |
| 1 US Dollar | Sh. 74.22 | Sh 74.50 |


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An American tourist arrived in Kenya with 20, 000 Euros. He converted all the Euros into Kenya shillings at the bank. He spent Ksh 2, 510, 200 while in Kenya and converted the remaining into US Dollars at the bank. Find the amount in dollars that he received to the nearest dollar. **(3mks)**

**5.** Solve the equation $(\log x)^2 - \log x - 2 = 0$ **(4mks)**

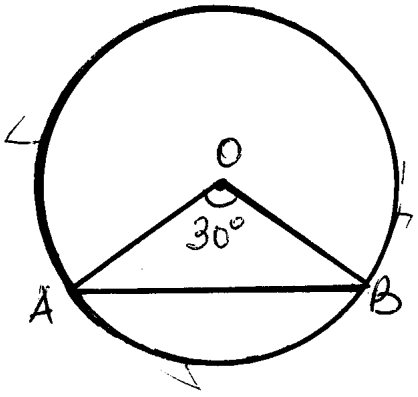
**6.** During a certain ceremony, goats and chicken were slaughtered. The number of heads for both goats and chicken was 45. The total number of legs was 100. Determine the exact number of goats and chicken slaughtered. **(4mks)**

**7.** Find the integral values of X which satisfy the inequality

$x + 11 > 4x - 9 \geq 2(2 - x)$ **(3mks)**

**8.** Momanyi paid Ksh 160 for a shirt after getting a discount of 20%. The vendor made a profit of 30% on sale of this shirt. What percentage profit would the vendor have made if no discount was allowed? **(3mks)**

9. The figure below shows a circle centre O. Chord AB subtends $30^0$ at the centre. If the area of the minor segment is $5.25cm^2$, find the radius of the circle $\left(Take\ \pi = \frac{22}{7}\right)$ (3mks)





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**10.** Expand the expression **(2mks)**

$(x^2-4)(x^2+4)(x^4-16)$

**11.** A point P is 40m on a bearing of $320^0$ from a point R. The bearing of point Q from R is $080^0$ and 60m from it. Using a scale of 1:10. Show the relative positions of P,Q and R, hence find the distance PQ. **(3mks)**

**12.** The figure below shows a triangle

Draw the net of the solid hence or otherwise find its surface area.

**13.** Simplify $\dfrac{a^4-b^4}{a^3-ab^2}$ **(3mks)**

**14.** Solve for x in the equation **(3mks)**

$2^{x-1}\times\left(\dfrac{1}{8}\right)^{1-x}=4^{3x-1}$

**15.** A solid cone of radius 13cm and height 18cm is recasted into a hemispherical solid. Find the surface area of the hemisphere to 1d.p $(Use\ \pi=3.142)$ **(4mks)**

**16.** Using a ruler and a pair of compasses only, construct a rhombus ABCD given that AB = 6cm and $\angle ABC=105^0$. **(3mks)**

## SECTION II (50 MARKS)

***Answer any five questions in this section***

17. A cinema hall has 200 seats. Ticket prices are Sh 50 for an adult and sh 25 for a child

(a) One evening 80% of the seats in the cinema hall were occupied and 20 of the people present were children. Calculate the total money collected from the sale of tickets. (3mks)


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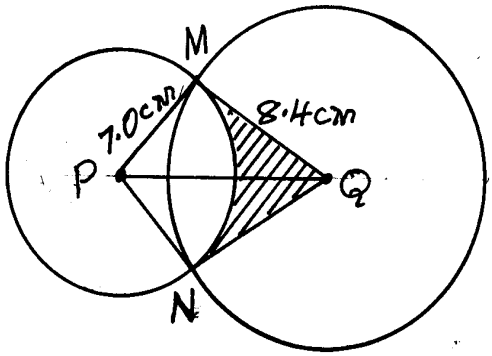
(b) On another evening, x children were present and all seats were occupied. The money colleted from the ticket sales was sh 9050. Calculate the value of x. **(3mks)**

(c) The money collected from tickets for a week is divided among costs, wages and profits in the ratio 2:3:7. If the profit for the week is sh 63,000. Calculate

**(i)** total amount collected for the week. **(2mks)**

**(ii)** the cost for the week **(2mks)**

18. Two circles of radius 7cm and 8.4cm with centres P and Q respectively intersect at points M and N as shown below.




Given that the centres of the circles are 12cm apart, find

(a) Angle MPN **(3mks)**

(b) Angle MQN **(3mks)**

(c) The area of quadrilateral MPNQ correct to 2dp **(2mks)**

(d) The area of the shaded part correct to 2d.p (Take $\pi = \frac{22}{7}$) **(2mks)**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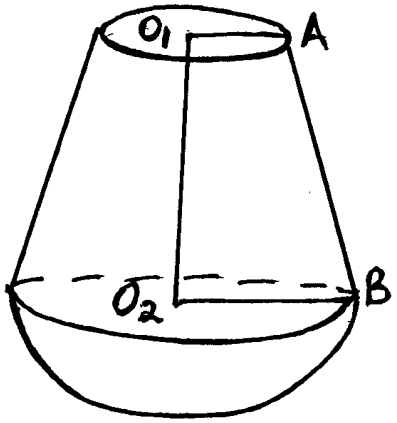
19. The diagram below represents a solid consisting of a hemispherical bottom and a conical frustum at the top. $O_1O_2$ = 4cm, $O_1$,B= 4.9cm and $O_1$,A = 2.1cm (Take $\pi = 3.142$)

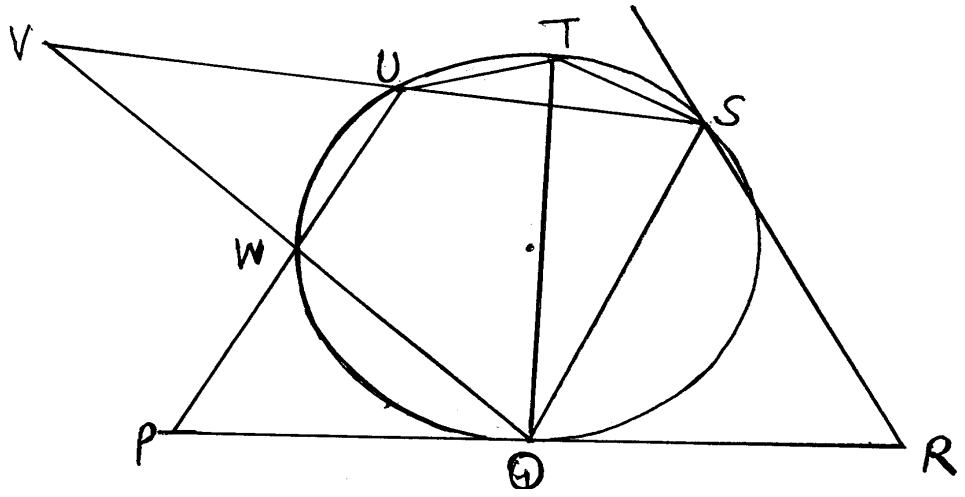



(a) Determine the height of the chopped off cone and hence the height of the bigger cone. **(2mks)**

(b) Calculate the surface area of the solid to 2d.p. **(4mks)**

(c) Calculate the volume of the solid to 4 s.f **(4mks)**

20. The figure below show a circle with chord UW and tangent PQR meeting at P. RS is another tangent that meets tangent PQR at R




Given that $\angle WUS = 82^O$, $\angle QWU = 150^0$, $\angle WPQ = 72^0$ *and* $\angle RQS = 28^0$, *Find by giving reasons*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(a) $\angle TSQ$ **(2mks)**

(b) $\angle$SQV **(2mks)**

(c) $\angle$WVU **(2mks)**

(d) $\angle$QTS **(2mks)**

(e) $\angle$PWQ **(2mks)**

**21. (a)** Find $A^{-1}$ given that $A = \begin{pmatrix} 2 & 4 \\ 3 & 4 \end{pmatrix}$ **(2mks)**

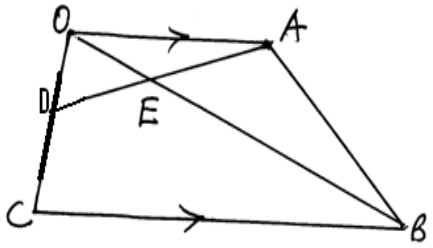
**(b)** Afflex bought 16 shirts and 32 trousers for sh 20, 800, in January.If he had bought 15 shirts and 20 trousers, he would have saved sh. 6, 300.

(i) From a matrix equation to represent the above information. **(1mk)**

(ii) Use matrix $A^{-1}$ to find the price of each item. **(3mks)**

**(c)** The following Month the cost of a shirt increased by 10% while that of a trouser increased by 5%. If he bought 12 shirts and 10trousers, find the percentage increase in the total cost of both items. **(4mks)**

22. The figure below shows a trapezium OABC in which OA is paralled to CB.




Given CB = 4OA, D is a point on OC such that OC:OD = 5:1 AD and OB intersect at E. If OA = $\underset{\sim}{a}$ and OD = $\underset{\sim}{d}$

**(a)** Express interms of $\underset{\sim}{a}$ and $\underset{\sim}{d}$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**(i)** AD (1mk)

(ii) OB **(2mks)**

**(b)(i)** If AE = k AD where k is a scalar, express in terms of a, d and k OE **(2mks)**

**(ii)** If OE = hOB where h is a scalar, find values of h and k **(4mks)**

**(iii)** State the ratio of DE: EA (1mk)

**23.** Use data below to answer the questions that follow

| Class | 1 – 15 | 16 – 30 | 31 – 45 | 46 – 60 | 61 – 75 | 76 – 90 | 91 – 105 |
|---|---|---|---|---|---|---|---|
| Frequency | 4 | 1 | 7 | 9 | 2 | 5 | 2 |

**(a)** State the modal frequency. **(1mk)**

**(b)** Calculate the mean using 38 as an assumed mean **(5mks)**

**(c)** State the median class. **(1mk)**

**(d)** Calculate the Median (3mks)

**24.** Below are the measurements of a wheat field using a baseline XY recorded in metres.

| | | |
|---|---|---|
| | Y | |
| | 240 | |
| TO R 60 | 190 | |
| | 180 | 75 TO Q |
| | 150 | 50 TO P |
| TO S 100 | 120 | |
| | 100 | 100 TO N |
| TO T 30 | 50 | |
| | 20 | 20 TO M |
| | X | |

(a) Using a scale of 1cm represents 20m. Sketch the map of the wheat field. **(4mks)**

(b) Find the area of the field in hectares. **(4mks)**

(c) If the cost of one hectare is sh 65,000 find the cost of the wheat field. **(2mks)**



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# K.C.S.E TOP EXAMINERS' MOCK SERIES 1
# QUESTION PAPER NO: 9

**121/1**

**MATHEMATICS**

**PAPER 1**

## section 1 (50marks)

**1.** Points S(-2,2) and T(-3,7) are mapped onto $S^1(4,-10)$ and $T^1(0,10)$ by an enlargement . Calculate the enlargement scale factor. **(3marks)**

**2.** Given that $\frac{1}{2x} = (0.732)^3 + \sqrt[3]{85.3}$ , use mathematical tables to find the value of x in standard form correct to 3 significant figures **(3marks)**

**3.** Simplify $\frac{12x^2+ax-6a^2}{9x^2-4a^2}$ **(3 marks)**

**4.** All prime numbers less than ten are arranged in ascending order to form a number.

(a) Write down the number formed **(1 mark)**

(b) Express the number in (a) above in expanded form **(2 marks)**

**5.** A two digit number is such that the one's digit is four more than the tens digit, and the sum of the digits is 14. Find the number **(3 marks)**


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**6** Paul bought a refrigerator on hire purchase by paying monthly instalments of Ksh. 2000 per month for 40 months and a deposit of Ksh. 12,000. If this amounted to an increase of 25% of the original cost of the refrigerator, what was the cash price of the refrigerator? **(3 marks)**

**7.** Find all the integral values of x which satisfy the inequality **(3 marks)**

$$3\,(1 + x) < 5x - 11 < x + 45$$

**8.** Without using calculator, evaluate

$$\left(\frac{7}{3}\left[\frac{2}{5}of\,1\frac{2}{3} - \frac{1}{2}\left(\frac{1\frac{2}{3} - 2\frac{1}{2}}{\frac{1}{3} - \frac{19}{27}}\right)^{\frac{1}{2}} + \frac{2}{3}\right]\right)^{\frac{1}{2}}$$ leaving the answer as a mixed fraction. **(4 marks)**

**9.** During a certain month, the exchange rates in a bank were as follows;

| | **Buying (Ksh.)** | **Selling (Ksh.)** |
|---|---|---|
| **1 US $** | **91.65** | **91.80** |
| **1 Euro** | **103.75** | **103.93** |

A tourist left Kenya to the United States with Ksh.1 000,000.On the air port he exchanged all the money to dollars and spent 190 dollars on air ticket. While in US he spent 4500 dollars for upkeep and proceeded to Europe. While in Europe he spent a total of 2000 Euros. How many Euros did he remain with**?** **(3marks)**

**10.** A school decided to make a beautiful picnic site to be used by students and teachers as a resting point. The site was designed to be triangular in shape measuring 40 metres, 60 metres and 80 metres. Calculate the area of the picnic site. (Answer correct to 1 d.p) **(3 marks)**


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**11** A regular *n*-sided polygon has its interior angle equal to 4 times its exterior. Find *n*. **(3 marks)**

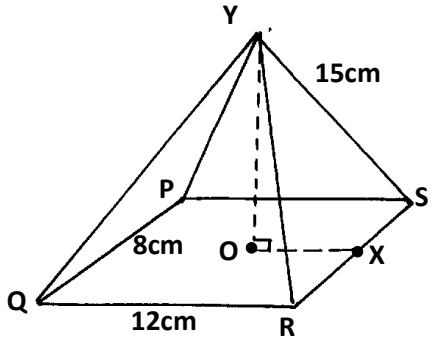
**12.** The ratio of the lengths of the corresponding sides of two similar rectangular petrol tanks is 3:5.The volume of the smaller tank is $8:1m^3$.Calculate the volume of the larger tank. **(3 marks)**

**13.** ABCD is a rhombus. A is the point (2, 1) and C is the point (4, 7). Find the equation of the diagonal BD in the form ax + by = c**.** **(3marks)**

**14.** A man walks directly from point A towards the foot of a tall building 240m away. After covering 180m, he observes that the angle of elevation of the top of the building is $45^0$.Determine the angle of elevation of the top of the building from A. **(3 marks)**

**15.** The G.C.D. and L.C.M. of three numbers are 3 and 1008 respectively. If two of the numbers are 48 and 72, find the least possible value of the third number. **(3 marks)**

16. An ant moved from Y to X the midpoint of RS through P in the right pyramid below




Draw the net of the pyramid showing the path of the ant hence find the distance it moved. **(4marks)**

## SECTION II (50 marks)

## ANSWER ANY FIVE

17. Three warships A,B and C are at sea such that ship B is 500km on a bearing N30E from ship A. Ship C is 700km from ship B on a bearing of $120^o$.An enemy ship D is sighted 800km due south of ship B.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**a)** Taking a scale of 1cm to represent 100km, locate the positions of ships A, B ,C and D**.(4 marks)**

**b)** Find the bearing of:

i) Ship A from D **(1 mark)**

ii)Ship D from C **(1 mark)**

**c)** Use scale drawing to determine the distance between

**i)** D and A **(1 mark)**

**ii)** C and D. **(1 mark)**

**d)** Measure angle DAC and angle BCD **(2 marks)**

**18.** a) A rectangular tank of base 2.4m by 2.8m and a height of 3m contains 3600litres of water initially. Water flows into the tank at the rate of 0.5litres per second. Calculate:

i)The amount needed to fill the tank **(2marks)**

ii) The time in hours and minutes required to fill **(3marks)**

**b).** Pipe A can fill an empty tank in 3hours while pipe B can fill the same tank in 6hours .When the tank is full, it can be emptied by pipe C in 8hours .Pipes A and B are opened at the same time when the tank is empty .If one hour later pipe C is also opened, find the total time taken to fill the tank. **(5marks)**

**19.** A solid is made up of a conical frustum and a hemispherical top. The slant height of the frustum is 8cm and its base radius is 4.2cm.If the radius of the hemispherical top is 3.5cm

a) Find the area of:

i) the circular base. **(2 marks)**


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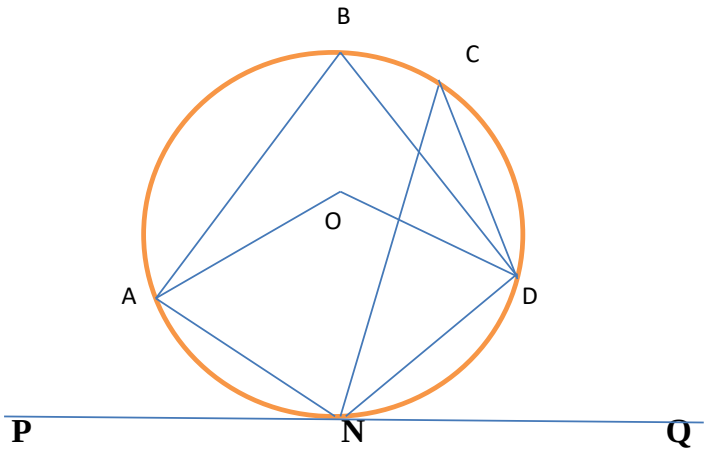
ii) the curved surface of the frustum **(3 marks)**

iii) the hemispherical surface **(3marks)**

**b)** A similar solid has a total surface area of 81.51cm$^2$.Determine the radius of its base. **(2marks)**

19. In the figure below, O is the center of the circle. PQ is a tangent to the circle at N. Angle NCD is 10° and angle ANP is 30°




Giving reasons find;

a) Angle DON **(2marks)**

b) Angle DNQ **(2marks)**

c) Angle DBA **(2marks)**

d) Angle ONA **(2marks)**

e) Angle ODN. **(2marks)**

20. Two quantities P and Q are connected by the equation **$P = KQ^n$**. The table below gives the values of P and Q

| | | | | | | |
|---|---|---|---|---|---|---|
| P | 1.2 | 1.5 | 2.0 | 205 | 3.5 | 4.5 |
| Q | 1.58 | 2.25 | 3.39 | 4.74 | 7.86 | 11.5 |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**a)** State the linear equation connecting P and Q **(1 mark)**

**b)** Using a scale of 1cm to represent0.1 units in both axes, draw a suitable straight line graph on the grid provided **(5 marks)**

**c)** Use your graph in b) above to determine the approximate values of **K** and **n. (2 marks)**

**d)** From the graph, find the value of Q when P=3 **(2 marks)**

22.The displacement h metres of a particle moving along a straight line after t seconds is given by $h=-2t^3+\frac{3}{2}t^2+3t$.

**a)** Find its initial acceleration **(3 marks)**

**b)** Calculate;

**i)** The time when the object was momentarily at rest **(3 marks)**

**ii)** Its displacement by the time it comes to rest **(2 marks)**

**c)** Calculate the maximum speed attained **(2 marks)**

**23.a)** Complete the table below for graphs of y=sinx and y=2sin(x+30) **(2 marks)**

| **x** | o | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 | 360 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **sin x** | 0 | | 0.87 | | | 0.5 | | | -0.87 | | | -0.5 | |
| **2sin (x +30)** | 1 | 0.5 | | 1.74 | | 0 | -1 | | | | -1 | | |

**e)** Using a suitable scale on the grid below draw the graphs of y = sin x and y = 2sin (x +30) for $0 \leq x \geq 360^0$ **(4 marks)**

**c)** State the transformations that would map y= sinx onto y=2sin(x+30). **(2 mark)**

**d)** Find the values of x which satisfy the equation sin x – 2sin (x +30) =0. **(2 marks)**


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24. A trailer moving at a speed of 80km/h is being overtaken by a car moving at 100km/h in a clear section of a road. Given that the bus is 21m long and the car is 4m long.

**a)** How much time (in seconds) will elapse before the car can completely overtake the bus? **(3 marks)**

**b)** How much distance (in metres) will the car travel before it can completely overtake the bus? **(2 marks)**

**c)** Given that as soon as the car completed overtaking the trailer, a bus heading towards the trailer and the car and moving at a speed of 90km/h became visible to the car driver. It took exactly 18 seconds for the car and the bus to completely by pass each other from the moment they first saw each other.

**i.** How far was the tail of the bus from the tail of the car at the instance they first saw each other given that the bus is 12 metres long? **(3 marks)**

**ii.** How far a part was the trailer and the bus just immediately after the car and the bus had passed each other? **(2 marks)**


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# K.C.S.E TOP EXAMINERS' MOCK SERIES 1
# QUESTION PAPER NO: 10

**121/1**

**MATHEMATICS**

**PAPER 1**

**1.** Evaluate without using tables or a calculator **(3mks)**

$$\frac{-5-(-7)\times -3+6}{(-36+30)0f-8\div 4+144\div -4}$$

**2.** A school uses $\frac{2}{5}$ of its funding on food, ¼ of the remainder on stationary and $\frac{1}{6}$ of what remained on PTA funding. It still has sh 900,000 left. Determine the original amount of money that the school had**. (3mks)**

**3.** Simplify completely **(3mks**)

$$\frac{1}{xy-3}-\frac{5}{x^2y^2-xy-6}$$

**4.** Given that A is an obtuse angle and that Tan A=$\frac{-15}{8}$. Find without using tables or calculator the value of :-

$$\frac{\sin A}{1-\cos A}$$ **(3mks)**

**5.** What is the least number of books that if a teacher divides among 6 students 5 books remain or if he divides among 8 students 7 books remain or if he divides among 16 students 15 books remain **(3mks)**


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**6.** 3 litres of water (density 1g/cm$^3$) is added to 5 litres of alcohol (density 0.8g/cm$^3$). Calculate the density of the mixture in g/cm$^3$ **(3mks)**

**7.** A straight line $L_1$ has its X intercept a-3 and its y-intercept5.

a) Write the equation of $L_1$ in the form $\frac{x}{a}+\frac{y}{b}=1\ (1mks)$

b) Find the equation of another line $L_2$ which passes through (1, -2) and is perpendicular to $L_1$ **3mks**

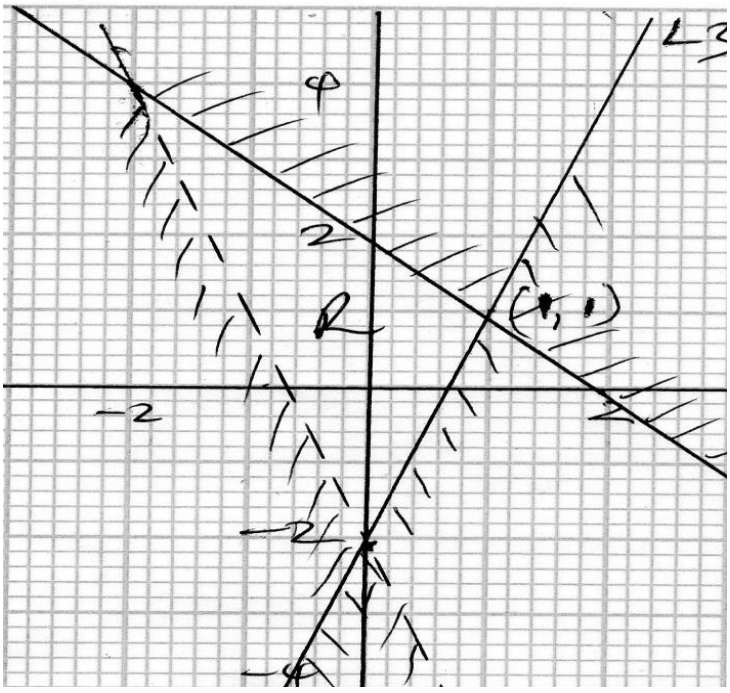
**8.** Use reciprocals, squares and square root table to evaluate **(3mks)**

$$\frac{2}{(0.5245)^2}-\frac{5}{\sqrt{363.4}}$$

**9.** Using a ruler and a pair of compasses only construct triangle ABC such that BC=6cm, <ABC=75$^o$ and BCA=45$^o$. Drop a perpendicular to BC from A to meet BC at O hence find the area of triangle ABC **(3mks)**

**10.** A hollow cylindrical alloy of length 6cm weighs 528g. if its internal and external radii are 3cm and 4cm respectively. Calculate the density of the metal. Use $\pi=\frac{22}{7}$ **(3mks)**

**11.** Write down the inequalities that define the region R given below. **(3mks)**





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**12.** Three people Jane, Peter and Kimtai decided to start a business with a total of Ksh 400,000. The ratio of the contributions of Jane to Peter was 2:3 and that of Peter to Kimtai was 2:5. How much did Kimtai contribute? **(3mks)**

**13.** A point P divides AB externally in the ratio -5:2. Given that the coordinates of A is (-2, 4) and B is (4, 7). Find the coordinates of P. **(3mks)**

**14.** A sales lady earns a basic salary of Ksh 20,000. In addition she is paid a commission as follows;

| | Commission |
|---|---|
| For sales up to 50,000 | 0% |
| For sales above 50,000 | |
| i)For the first 20,000 | 2% |
| ii) For the next 30,000 | $3\frac{1}{2}$% |
| For sales above 100,000 | 5% |

In the month of December, 2014, she received sh 23, 950 as her total pay. Calculate the value of the goods she sold that month. (4mks)

**15.** The average speed of two trains A and B are 36km/h and 48km/h respectively. A leaves the station at 1200hrs. If B leaves the same station at 1400 hrs. At what time will it catch up with A? **(3mks)**

**16.** Two equal sides of a triangle plot are 40m long given that the angle enclosed by these sides is obtuse and that the area of the plot is $400m^2$

Find;

i)The size of the angle **(1mk)**

ii) The length of the third side **(2mks)**


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**17.** A tailor bought a number of suits at a cost of sh 57600 from Jimco clothing. Had he bought the same suits from Gikondi clothing it would have enabled him sh 480 less per suit. This would have enabled him to buy 4 extra suits for the same amount of money. If x represent the number of suits bought.

**a)** Write an expression of the cost per suit bought from

**i)** Jimco clothing **(1mk)**

**ii)** Gikondi clothing **(1mk)**

**b)** For an equation in x and determine the number of suit the tailor bought (4mks)

**c)** The tailor later sold each suit for sh 720 more than he had paid for it. Determine the percentage profit **(4mks)**

**18.** The table below shows the distribution of child birth in 60 hospitals

| No. of births | 11-20 | 21-25 | 26-35 | 36-55 | 56-65 |
|---|---|---|---|---|---|
| Frequency | 5 | x | 12 | 20 | 15 |

**a)** Given that the mean number of birth is 41.375, find the value of x **(3mks)**

**b)** Calculate the median for data **(3mks)**

**c)** On the grid provided below draw histogram for the data. Use a scale of; (4mks)

1 cm to represent a width of 5- x-axis

4cm to represent 1 unit on the vertical axis



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**19.** A particle moves along a straight line such that its distance 5 meters from affixed point O at time t seconds is given by $s=4t-2t^2+t^3$, find

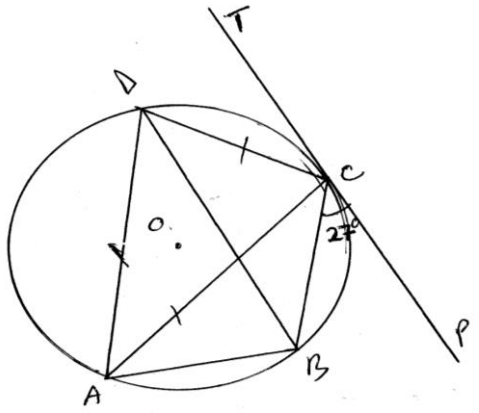
**a)** The average speed of the particles during the third second **(3mks)**

**b)** At what times is the particle momentarily at rest **(3mks)**

**c)** The position of the particle when the particle is momentarily at rest **(2mks)**

**d)** The acceleration at t=3 seconds (2mks)

**20.** In the diagram below PT is a tangent to the circle centre O. ABCD is a cyclic quadrateral while triangle ACD is an equilateral triangle. Angle BCP=27°





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Find giving reasons the angles

**a)** DCT (2mks) **b)** DBC (2mks) **c)** DAB (2mks) **d)** ADB (2mks) **e)** ABC (2mks)

**21.** a) Complete the table below for $y=x^3+2x^2-5x-6$ (2mks)

| X | -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 |
|---|---|---|---|---|---|---|---|---|
| Y | | | | | | | | |

**b)** On the grid provided draw the graph of $y=x^3+2x^2-5x-6$ for $-4 \leq x \leq 3$ use a scale of; **(3mks)**

1 cm to represent 1 unit horizontal axis

1 cm to represent 5 units vertical axis

**i)** Use your graph to solve the equation, $y=x^3+2x^2-5x-6=0$ **(2mks)**

**ii)** Estimate the coordinates of the turning point of the curve **(1mks)**

iii) By drawing a suitable straight line on the graph solve the equation $y=x^3+2x^2-10x-11=0$ **(2mks)**

**22.** A quadrilateral ABCD has vertices A(-5,0), B (-9,-2), C(-5,-6) and D(-3, -2). Quadrilateral A'B'C'D' has vertices A'(1,0), B'(3,1), C'(1,3) and D'(0,1)

**a)** Plot both quadrilateral on the same set of axes **(2mks)**

**b)** Describe fully the transformation that maps ABCD onto A'B'C'D' **(3mks)**

**c)** A"B"C"D" is the image of A'B'C'D' under a positive quarter turn about (0, 0). Plot quadrilateral A"B"C"D" on the same grid and state its coordinates **(3mks)**

**d)** Quadrilateral A'''B'''C'''D''' is the image of A"B"C"D" under a reflection in the line y-x=0. Plot A'''B'''C'''D''' on the same axes **(1mk)**

**e)** Write down the coordinates of $\Delta A_4, B_4 C_4 D_4$ the image of A"' B"'C"'D''' under a translation given by $\begin{pmatrix} 2 \\ -5 \end{pmatrix}$ **(2mks)**



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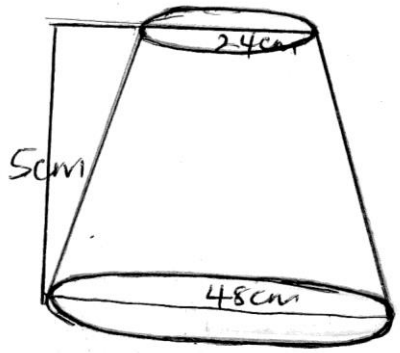
**23.** A lamp shade below is in form of a frustum of a cone open at both ends. The upper diameter is 24cm and the lower one is 48cm. if the shade is 5cm long. Use $\pi = 3.142$




Find

**a)** The perpendicular height of the cone that was chopped off **(2mks)**

**b)** The surface area of the frustum **(4mks)**

**c)** The volume of the frustum **(4mks)**

**24.** From Jane's home, her school is 150m on a bearing of N60°E. The shopping centre is on a bearing of 150° from the school and 110° from Jane's home. The church she attends is 180 m from her home on a bearing of 320°. Using a scale of 1cm to represent 30m

**a)** Show the relative positions of the four points (4mks)

**b)** Use the drawing to determine

**i)** The distance of the school from the shopping centre **(1mks)**

**ii)** The distance of her home from the shopping centre **(1mks)**

**iii)** The distance and bearing of the church from the shopping centre **(2mks)**

**iv)** The distance and bearing of the school from the church **(2mks)**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