INDICES

1.

Simplify $\frac{25^{3/4}\times 0.9^2\times 2^2}{5^{5/2}\times 3^3}$

in the form $^{A}/_{B}$ where A and B are integers **(2mks)**

2.

Solve for x in

$$5^{2x-1} = 12^{x}$$ **(3mks)**

3.

Solve for x in

$$4^{x+1} = 32$$ **(3mks)**

4.

Solve for x in

$$9^{x} + 3^{2x} - 1 = 53$$ **(3mks)**

5.

Find the value of x in the following equations:

$49^{x+1} + 7^{2x} = 350$ **(4mks)**

6.

Find the value of x which satisfies the equation **(4mks)**

$$16^{x^2} = 8^{4x-3}$$

7.

Find the value of m in the following equation

$$(^{1}/_{27})^{m} \times (81)^{-1} = 243$$ **(3mks)**

8.

Given that $P = 3^{y}$, express the equation $3^{2y-1} + 2 \times 3^{y-1} = 1$ terms of P. **(1mk)**

Hence or otherwise find the value of y in the equation

$$3^{2y-1} + 2 \times 3^{y-1}$$ **(3mks)**

9.

Simplify $\sqrt{2^{x}\times 5^{2x}\div 2^{-x}}$ **(2mks)**

10.

Find the value of x which satisfy the equation

$$5^{2x} - 6 \times 5^{x} + 5 = 0$$ **(4mks)**

11.

Solve for x in the equation $32^{(x-3)} \div 8^{(x+4)} = 64 \div 2^{x}$ **(3mks)**

12.

Solve for x in the equation $\dfrac{81^{2x} \times 27^{x}}{9^{x}} = 729$ **(3mks)**

13.

Find the value of y in the equation

$$\frac{243 \times 3^{2y}}{729 \times 3^{y} \div 3^{(2y-1)}} = 81$$ **(3mks)**

14.

Simplify

$$\frac{27^{\frac{2}{3}} \div 2^{4}}{32^{-\frac{3}{5}}}$$ **(3mks)**

15.

Without using logarithm tables or calculators, evaluate

$$\frac{64^{-\frac{1}{2}} \times 27000^{\frac{2}{3}}}{2^{-4} \times 3^{0} \times 5^{2}}$$ **(4mks)**

16.

Without using mathematical tables or a calculator, evaluate

$$27^{\frac{2}{3}} \times \left(\frac{81}{16}\right)^{-\frac{1}{4}}$$ **(3mks)**

17.

Given that $9^{2y} \times 2^{x} = 72$, find the values of x and y **(3mks)**

18.

Simplify $\dfrac{243^{\frac{-2}{5}} \times 125^{\frac{2}{3}}}{9^{\frac{-3}{2}}}$ **(3mks)**

EVALUATION OF NUMERIC EXPRESSIONS

(Using Mathematical tables**)**

1.

Use logarithms to evaluate **(4mks)**

$$\sqrt[3]{(35.6 \times 0.0613^2)}$$

2.

Evaluate $\dfrac{1.34}{(5.24)^{0.8} \times 0.0029}$ **(4mks)**

3. Use mathematical tables to evaluate **(3mks)**

$$\sqrt{\left[\frac{2.935 \times 0.0765}{32.74}\right]}$$

4. Use logarithms to evaluate $\sqrt[3]{\left[\dfrac{7.08}{76.8 \times 7.034}\right]}$ **(4mks)**

5.

Use logarithms to evaluate $\dfrac{\sqrt{0.0645}}{0.0082}$ **(3mks)**

6.

Use logarithms to evaluate

$$\sqrt[4]{\frac{4.562 \times 0.038}{0.82}}$$ **(4mks)**

7.

Use logarithms to evaluate **(4mks)**

$$\frac{(0.07284)^2}{3\sqrt{0.06195}}$$

8.

Use logarithms to evaluate $3\sqrt{\frac{36.15\times 0.02573}{1.938}}$ **(3mks)**

9.

Use logarithms to evaluate $\frac{(1934)^2\times\sqrt{0.00324}}{436}$ **(4mks)**

10.

Use logarithms to evaluate $55.9\div(0.2621\times 0.01177)^{\frac{1}{5}}$ **(4mks)**

11.

Use logarithms to evaluate $\left(\frac{6.79\times 0.3911}{\log 5}\right)^{\frac{3}{4}}$ **(4mks)**

12.

Use the logarithms to evaluate $3\sqrt{\frac{1.23\times 0.0089}{76.54}}$ **(4mks)**

13.

Find the reciprocal of 0.342. Hence evaluate:

$$\frac{\sqrt{0.0625}}{0.342}$$ **(3mks)**

14.

Use logarithms to evaluate

$$(3.256\times 0.0536)^{\frac{1}{3}}$$ **(4mks)**

15.

Use logarithms to evaluate $\frac{(0.0056)^{1/2}}{1.38\times 27.42}$ **(3mks)**

16.

Use reciprocal and square tables to evaluate, to 4 significant figures, the expression: $\frac{1}{24.56} + 4.346^2$ **(3mks)**

17.

Use logarithm tables to evaluate $\frac{2347 \times 0.4666}{3\sqrt{0.0924}}$ **(4mks)**

18.

Use logarithms to evaluate $\frac{34.33}{\sqrt{5.25 \times 0.042}}$ **(4mks)**

19.

Use tables of reciprocals only to work out

$$\frac{3}{0.6735} + \frac{13}{0.156}$$ **(3mks)**

20.

In this question, show all the steps in your calculations, giving your answers at each stage

Use logarithms, correct to 4 decimal places, to evaluate **(4mks)**

$$3\sqrt{\frac{36.72 \times (0.46)}{185.4}}^{-2}$$

21.

Using logarithm tables, evaluate $\left(\frac{0.032 \times 14.26}{0.006}\right)^{\frac{2}{3}}$ **(3mks)**

22.

In this question, show all the steps in your calculations, giving the answer at each stage. Use logarithms correct to decimal places, to evaluate.

$$\frac{6.373 \log 4.948}{\sqrt{0.004636}}$$

(3mks)

23.

Use logarithms, correct to 4 decimal places, to evaluate

$$3\sqrt{\frac{83.46 \times 0.0054}{1.56^2}}$$

(4mks)

24.

Find the reciprocal of 0.216 correct to 3decimal places, hence evaluate

(3mks)

$$\frac{\sqrt[3]{0.512}}{0.216}$$

25.

Use logarithms, correct to 4 significant figures, to evaluate

$$\sqrt{\frac{72.56 \text{ X } 0.64}{(1.845)^2}}$$ **(4mks)**

EQUATIONS OF STRAIGHT LINES

1.

A rhombus PQRS is such that Q lies on the x axis. The coordinates of vertices P and R are (2, 4) and (6, 2) respectively.

Determine

- The coordinates of Q **(4mks)**
- The coordinates of S **(4mks)**

2.

A perpendicular is drawn from a point (3, 5) to the line 2y + x = 3. Find the equation of the perpendicular. **(3mks)**

3.

A perpendicular to the line y - 4x + 3 = 0 passes through the point (-8, 5)

Determine its equation **(2mks)**

4.

The co-ordinates of the points P and Q are (1, -2) and (4, 10) respectively.

A point T divides the line PQ in the ratio 2: 1

(a) Determine the coordinates of T **(2mks)**

(b) (i) Find the gradient of a line perpendicular to PQ **(2mks)**

(ii) Hence determine the equation of the line perpendicular PQ and passing through T **(2mks)**

(iii) If the line meets the y- axis at R, calculate the distance TR, to three significant figures **(2mks)**

5.

The equation of a line is

$$-\frac{3}{5}x + 3y = 6$$

Find the:

(a) Gradient of the line **(1mk)**

(b) Equation of a line passing through point (1, 2) and perpendicular to the given line. **(3mks)**

6.

Find equation of the perpendicular to the line x + 2y – 4 and passes through point (2,1) **(3mks)**

7.

A line L_1 passes though point (1, 2) and has a gradient of 5. Another line L_2, is perpendicular to L_1 and meets it at a point where x = 4. Find the equation for L_2 in the form of y = mx + c **(4mks)**

8.

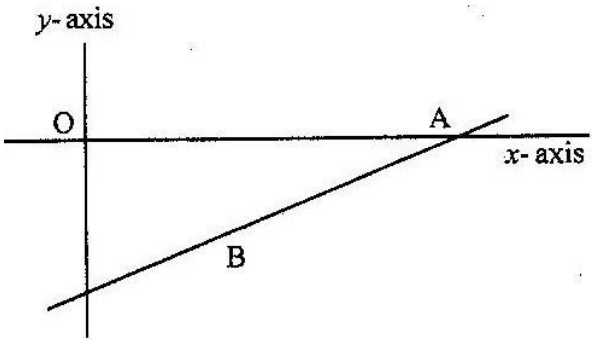
A straight line passes through points A (-3, 8) and B (3, -4).Find the equation of the straight line through(3,4) and parallel to AB. Give the answer in the form y – mx +c, and c are constants. **(3mks)**

9.

P(5,-4)and Q (-1,-2) are points on a straight line. Find the equation of the perpendicular bisector of PQ: giving the answer in the form y = mx+c. **(4mks)**

10.

On the diagram below, the line whose equation is 7y – 3x + 30 = 0 passes through the points A and B. Point A on the x- axis while point B is equidistant from x- and y – axes.



Calculate the co-ordinates of the points A and B **(3mks)**

11.

Two lines L_1 and L_2 intersect at a point P. L_1 passes through the points (-4, 0) and (0, 6). Given that L_2 has the equation: y = 2x – 2, find, by calculation, the coordinates of P. **(3mks)**

12.

A line with gradient of -3 passes through the points (3. k) and (k.8). Find the value of k and hence express the equation of the line in the form ax + by = c, where a, b, and c are constants. **(3mks)**

13.

Find the equation of a straight line which is equidistant from the points (2, 3) and (6, 1), expressing it in the form ax + by = c where a, b and c are constants **(4mks)**

14.

Three vertices of a rhombus ABCD are; A(-4,-3), B(1,-1) and C(3,4) are constants. **(2mks)**

a) Draw the rhombus on the grid provided below. **(2mks)**

b) Find the equation of the line AD in the form y = mx + c, where and c are constants. **(2mks)**

15.

The equation of line L_1 is 2y-5x-8=0 and line L_2 passes through the points (-5, 0) and (5,-4). Without drawing the lines L_1 and L_2 show that the two lines are perpendicular to each other. **(3mks)**

16.

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

17.

The diagonals of a rhombus PQRS intersect at T. Given that P(2,2),Q(3,6) and (-1,5):

(a) Draw the rhombus PQRS on the grid provided;

(b) State the coordinate of T. **(2mks)**

18.

A straight line *l* passes through the point (3,-2) and is perpendicular to a line whose equation is $2y - 4x = 1$. Find the equation of **/** in the form y= mx + c, where m and c are constants**.** **(3mks)**

19.

Three vertices of a parallelogram PQRS are P(-1, -2),Q(8,-5)and R(5,0).

a) On the grid provided below draw the parallelogram PQRS **(1mk)**

b) Determine the length of the diagonal QS. **(2mks)**

20.

A line *L* passes through point (3, 1) and is perpendicular to the line $2y = 4x + 5$.

Determine the equation of line *L.* **(3mks)**

21.

A straight line passes through points (-2, 1) and (6, 3).

Find:

a) equation of the line in the form y = mx + c; **(2mks)**

b) the gradient of a line perpendicular to the line in (a) **(1mk)**

22.

A line L passes through (-2, 3) and (-1, 6) and is perpendicular to a line P at (-1, 6).

(a) Find the equation of L **(2mks)**

(b) Find the equation of P in the form $ax + by = c$, where a, b and c are constants. **(2mks)**

(c) Given that another line Q is parallel to L and passes through point (1, 2) find the x and y intercepts of Q **(3mks)**

(d) Find the point of the intersection of lines P and Q **(3mks)**

23.

(a) A straight line L, whose equation is 3y — 2x = —2 meets the x-axis at R. Determine the co-ordinates of R. **(2mks)**

(b) A second line L_2 is perpendicular to L_1 at R. Find the equation of L_2 in the form $y = mx + c$, where m and c are constants. **(3mks)**

(c) A third line L_3 passes through (—4,1) and is parallel to L_2 Find:

(i) the equation of L_3 in the form y = mx + c, where m and c are constants **(2mks)**

(ii) the co-ordinates of point S, at which L intersects L **(3mks)**

TRANSFORMATIONS

REFLECTION, ROTATION, TRANSLATION, ENLARGMENT

1.

(a) On the grid provided, draw a square (s) with vertices (6, 3), (7, 0) (9, 4) and (10, 1).Draw also two straight lines AB and AC where the coordinates of A, B and C are (1,-2), (3, 2) and (0, 1) respectively.
S′ is the image of S under reflection in the line AB and S″ is the image of S′ under refection in the line AC. Draw S′ and S″ **(5mks)**

(b) Describe the transformation which maps S onto S″ if the transformation is

(i) translation **(1mk)**

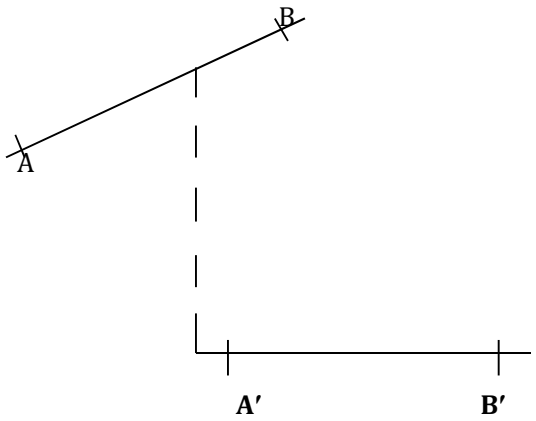
(ii) rotation **(2mks)**

2.

The image of P (0, 2), under an enlargement with a scale factor 3 is P′ (4, 6).
Find the centre of enlargement **(3mks)**

3.

In the figure below A′B′ is the image of AB under rotation. Use geometrical instruments to locate the centre of rotation for the figure **(3mks)**



4.

The points A' (3, 2) and B' (4,-1) are the images of A and B respectively under a translation.
Given that he coordinates of A are (0, 1) find the coordinates of B. **(3mks)**

5.

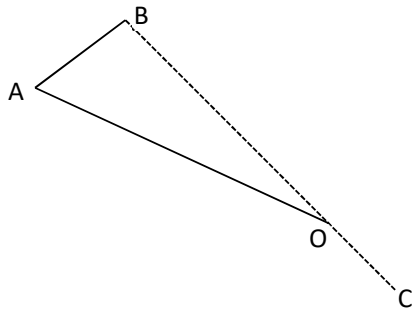
A translation maps a point (1, 2) onto) (-1, 2). What would be the coordinates of the object whose image is (-3 , -3) under the same translation? **(2mks)**

6.

A point (-5, 4) is mapped onto (-1, -1) by a translation. Find the image of (-4, 5) under the same translation. **(3mks)**

7.

In the figure below triangle ABO represents a part of a school badge. The badge has as symmetry of order 4 about O. Complete the figures to show the badge. **(3mks)**



8.

A triangle is formed by the coordinates A (2, 1) B (4,1) and C(1,6). It is rotated clockwise through 90^0 about the origin. Find the coordinates of this image. **(3mks)**

9.

A translation maps a point P (3, 2) onto P' (5,-4)

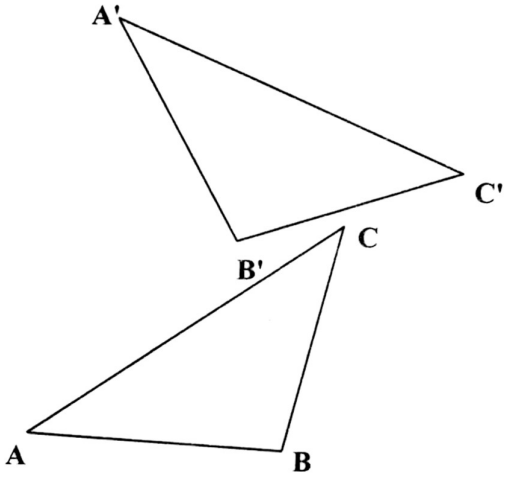
a) Determine the translation vector. **(1mk)**

b) A point Q′ is the image of the point (2, 5) under the same translation.

Find the length of P′Q′, leaving the answer in surd form. **(2mks)**

10.

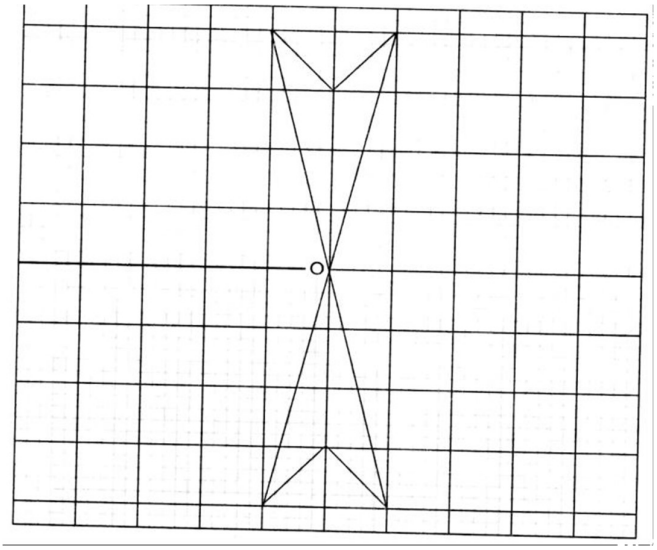
In the figure below, triangle A ′B′ C′ is the image of triangle ABC under a rotation, centre O.



By construction, find the label the centre O of the rotation. Hence, determine the angle of the rotation. **(3mks)**

11.

The diagram below is a part of a figure which has rotational symmetry of order 4 about O.

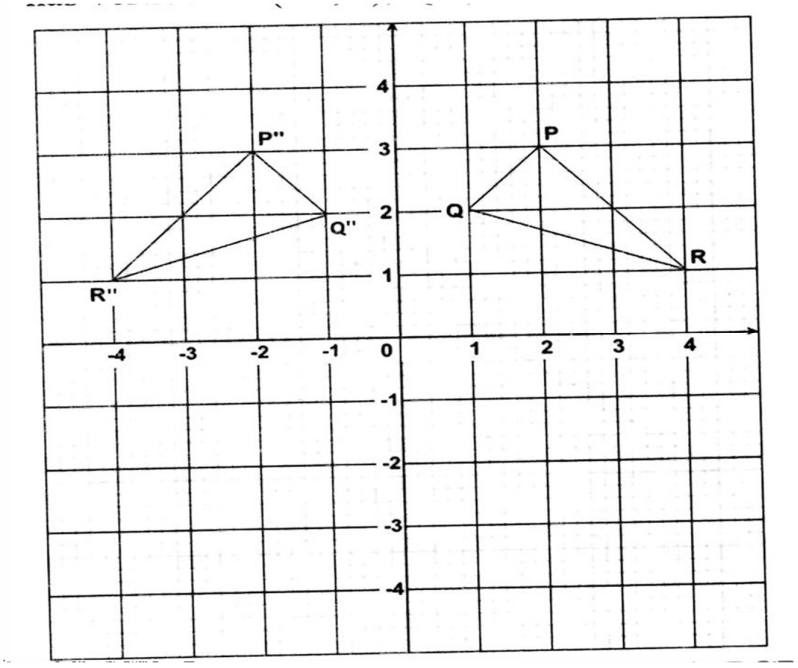


(a) Complete the figure **(1mk)**

(b) Draw all the lines of symmetry of the completed figure **(2mks)**

12.

On the Cartesian plane below, triangle PQR has vertices P(2, 3), Q (1,2) and R (4,1) while triangles P ″Q ″ R″ has vertices P″ (-2, 3), Q ″ (-1,2) and R ″ (-4, 1)



(a) Describe fully a single transformation which maps triangle PQR onto triangle P ″Q ″ R″ **(2mks)**

(b) On the same plane, draw triangle P′Q′R′, the image of triangle PQR, under reflection in line y = -x **(2mks)**

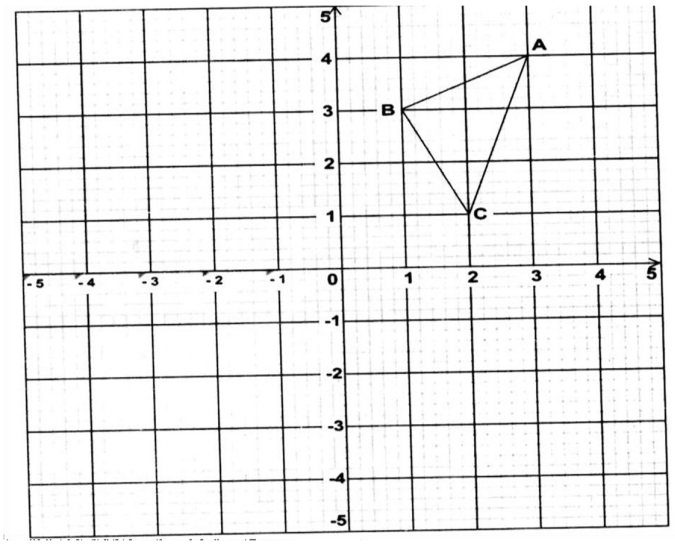
(c) Describe fully a single transformation which maps triangle P′Q′R′, onto triangle P″ Q ″ R″ **(2mks)**

(d) Draw triangle P ″′Q″′ R″′ such that it can be mapped onto triangle PQR by a positive quarter turn about (0,0) **(2mks)**

(e) State all pairs of triangle that are oppositely congruent **(2mks)**

13.

The diagram below shows a triangle ABC with A (3, 4), B (1, 3) and C (2, 1).



a) Draw △A ′B′C′ the image of ABC under a rotation of $+90^0$ about (0, 0). **(2mks)**

b) Draw △ A″B″C ″ the image of A ′B′C ′under a reflection in the line y=x. **(2mks)**

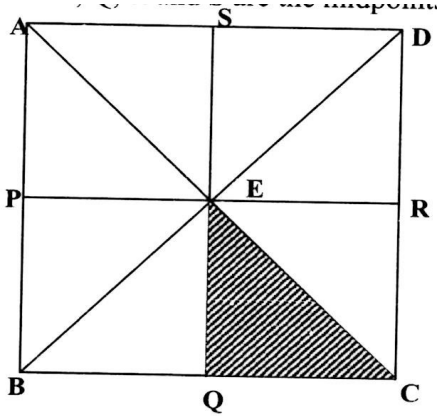
c) Draw △ A″′B″′C″′ the image of Δ A″B″C″ under a rotation of -90^0 about (0, 0) **(2mks)**

d) Describe a single transformation that maps △ABC onto △ A′″B′″C′″ **(2mks)**

e) Write down the equations of the lines of symmetry of the quadrilateral BB″A′″A′ **(2mks)**

14.

In the figure below, ABCD is a square .Points P, Q, R and S are the midpoints of AB, BC, CD and DA respectively.



(a). Describe fully:

(i) a reflection that maps triangle QCE onto triangle SDE. **(1mk)**

(ii) an enlargement that maps triangle QCE onto triangle SAE. **(2mks)**

(iii) a rotation that maps triangle QCE onto triangle SED. **(3mks)**

(b). The triangle ERC is reflected on the line BD. The image of ERC under the reflection is rotated clockwise through an angle of 90^0 about P.

Determine the images of R and C:

(i) Under the reflection **(2mks)**

(ii) After two successive transformations **(2mks)**

15.

The vertices of a triangle are A (1,2), B(3, 5) and C(4, 1).The coordinates of C' the image of C under a translation vector T, are (6, -2).

(a) Determine the translation vector T. **(1mk)**

(b) Find the coordinates of A′ and B′ under translation vector T. **(2mks)**

16.

The vertices of quadrilateral OPQR are O(0,0), P(2,0), Q(4,2) and R(0,3). The vertices of its image under a rotation are O'(1, -1), P'(1, -3) Q'(3, -5) an R'(4, -1).

(a) (i) On the grid provided, draw OPQR and its image O'P'Q'R' **(2mks)**

(ii) By construction, determine the centre and angle of rotation. **(3mks)**

(b) On the same grid as (a) (i) above, draw O''P''Q''R'', the image of O'P'Q'R' under a reflection in the line $y = x$ **(2mks)**

(c) From the quadrilaterals drawn, state the pairs that are:

(i) Directly congruent; **(2mks)**

(ii) Oppositely congruent **(2mks)**

17.

(a) On the grid provided, draw the square whose verticals are A (6, -2),
B (7, -2), C (7, -1) and D (6, -1). **(1mk)**

(b) On the same grid, draw:

(i) A B′C′D′, the image of ABCD, under an enlargement scale factor 3,
centre(9, -4); **(3mks)**

(ii) A″B″C″D″, the image of A′B′C′D′, under a reflection in the line x = 0; **(2mks)**

(iii) A‴B‴C‴D‴, the image of A″B″C″D″ under a rotation of + 90^0
about (0,0) **(2mks)**

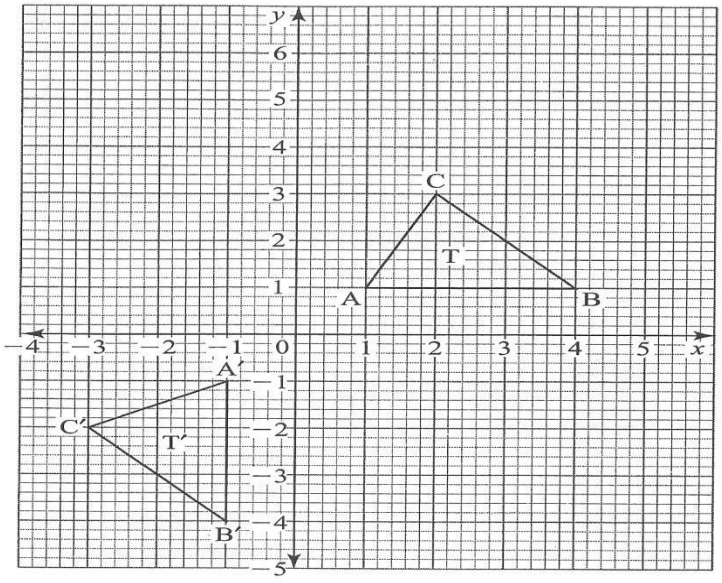
(c) Describe a single transformation that maps A′B′C′D′ onto A‴B‴C‴D‴ **(2mks)**

18.

Points A (-2, 2) and B (-3, 7) are mapped onto A' (4, -10) and B' (0, 10) by an enlargement.
Find the scale factor of the enlargement. **(3mks)**

19.

On the grid below, an object T and its image T’ are drawn



a) Find the equation of the mirror lien that maps T onto T'. **(1mk)**

b i) T' is mapped onto T" by positive quarter turn about (0,0). Draw T" **(2mks)**

ii) Describe a single transformation that maps T onto T" **(2mks)**

c) T" is mapped onto T"' by an enlargement, centre (2,0), scale factor -2 .
Draw T"' **(2mks)**

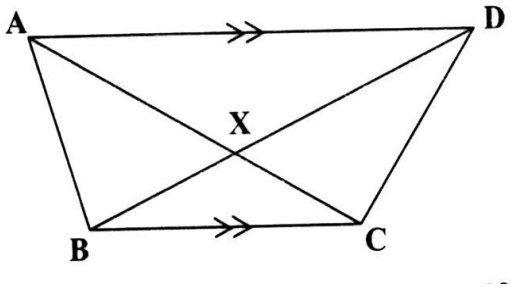
d) Given that he area of T"' is 12cm², calculate the area of T"' . **(3mks)**

SIMILARITY AND CONGRUENCY

1.

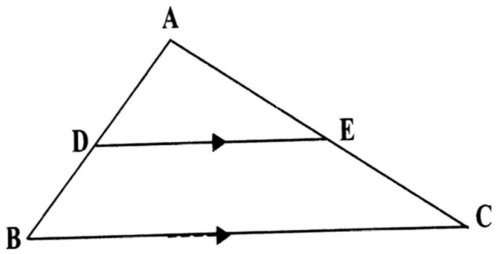
In the figure below, **ABCD** IS A cyclic quadrilateral and BC is parallel to AD.

Show that triangle ABX is congruent to triangle DXC. **(4mks)**

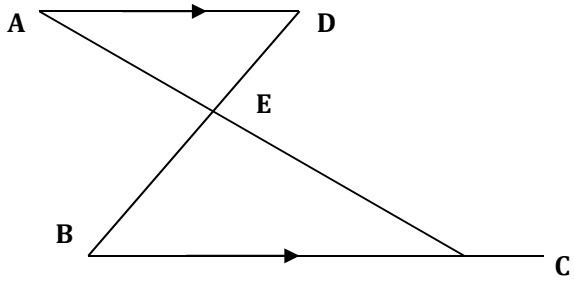


2.

In the triangle ABC shown below DE is parallel to BC. If AE = 3cm and EC = 2cm, determine the ratio of the triangle ADE to that of the triangle ABC. **(2mks)**

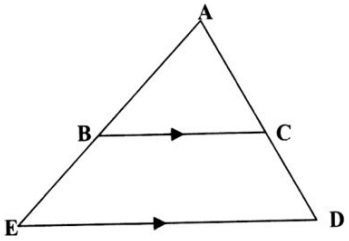


3. In the figure below AD // BC. AC and BD intersect at E. Given that AE: EC = 1:5 and BD =12 cm, calculate the length of DE. **(3mks)**

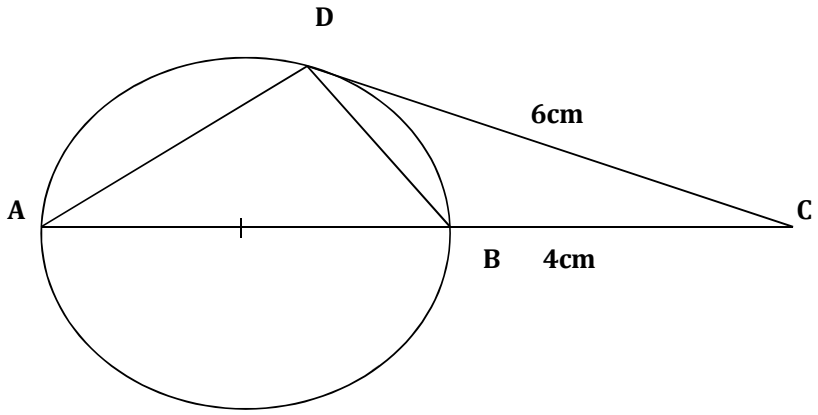


4.

In the figure above, triangle ABC is similar to triangle AED and BC // ED. Given that the ratio AB: AE = 2:5, find the ratio of the area of triangle ABC to that of the trapezium BCDE. **(3mks)**



5. In the figure given below (not drawn to scale) DC is a tangent to the circle centre O. AOBC is a straight line.



(a) Show that ΔADC is similar to Δ DBC.

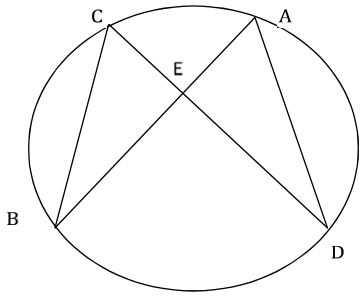
(b) Given that BC = 4cm AND DC = 6cm, calculate

(i) the length of AB **(3mks)**

(ii) the size of angle ACD **(2mks)**

6.

In the figure below, the chord AB and CD intersect at E. Show that ΔAED is similar to ΔBEC. **(3mks)**



7.

In the triangle ABC below AC=8cm, BC=5cm and angle BCA = 30^0. Point D divides BC in the ratio 1:4 and point E divides AC in the ratio 2:3. Find the area of the quadrilateral ABDE **(3mks)**

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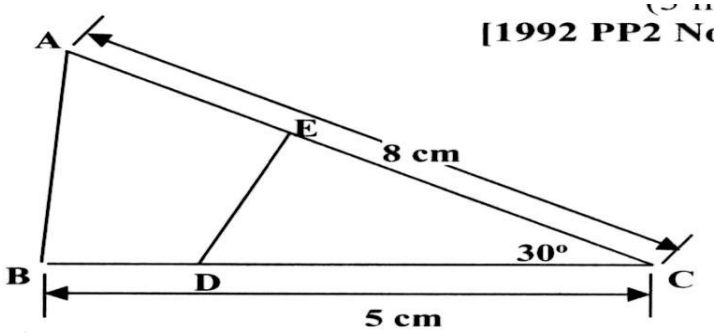


8. A football tube in the form of a sphere is inflated so that its radius increases in the ratio of 4:3. Find the ratio in which the volume is increased **(2mks)**

9.

A container of height 30cm has a capacity of 1.5 litres. What is the height of a similar container of capacity 3.0 m^3? **(3mks)**

10.

The ratio of the lengths of the corresponding sides of two similar rectangular water tanks is 3:5. The volume of the smaller tank is 8.1 m^3. Calculate the volume of the larger tank.

(3mks)

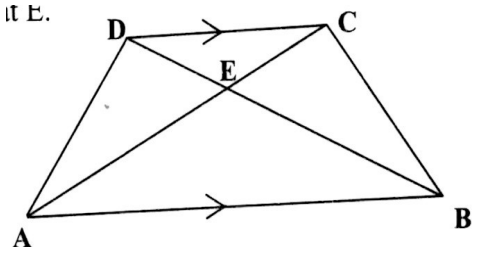
11.

Pieces of soap are packed in a cuboid container measuring 36cm by 24cm by 18cm. Each piece of soap is similar to the container. If the linear scale factor between the container and the soap is $^1/_6$, find the volume of each piece of soap.

(2mks)

12.

In the diagram below, ABCD is a trapezium with AB parallel to DC. The diagonals AC and BD intersect at E.



a) Giving reasons show that triangle ABE is similar to triangle CDE. **(2mks)**

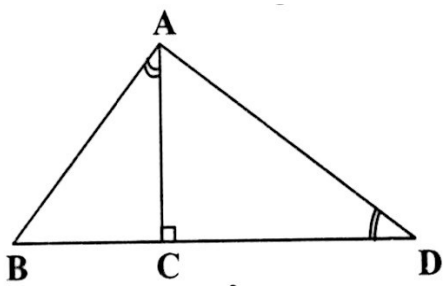
b) Giving that AB = 3DC, find the ratio of DB to EB. **(2mks)**

13. 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. **(4mks)**

14.

In the figure below, angles BAC and ADC are equal. Angle ACD is a right angle.

The ratio of the sides AC: BC = 4:3

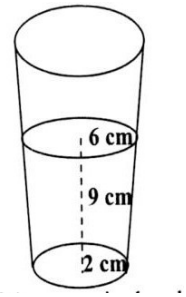


Given that the area of triangle ABC is $24cm^2$,find the area of triangle ACD

(4mks)

15.

A glass in the form of a frustum of a cone is represented by the diagram below. The glass contains water to a height of 9 cm. The bottom of the glass is a circle of radius 2 cm while the surface of the water is a circle of radius 6 cm.



(a) Calculate the volume of the water in the glass. **(3mks)**

(b) When a special marble is submerged into the water in the glass, the water level rises by 1 cm.

Calculate :

(i) the volume of the marble **(4mks)**

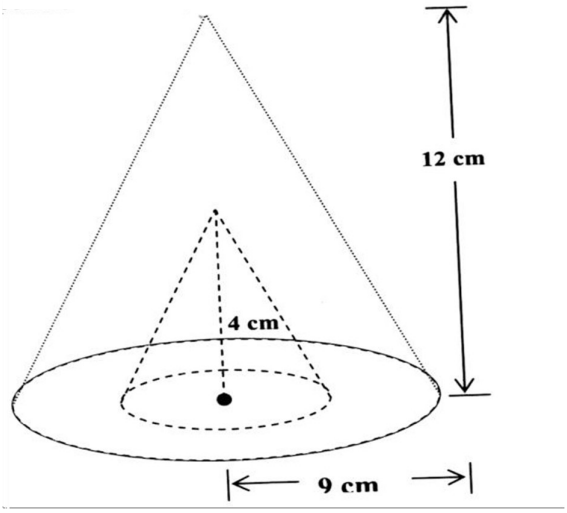
(ii) the radius of the marble **(3mks)**

16.

A small cone of height 8 cm is cut off from a bigger cone to leave a frustum of height 16cm. If the volume of the smaller cone is $160cm^3$, find the volume of the frustum **(3mks)**

17.

The figure below represents a cone of height 12 cm and base radius of 9 cm from which a similar smaller cone is removed, leaving a conical hole of height 4 cm.



a) Calculate:

i. The base radius of the conical hole; **(2mks)**

ii. The volume, in terms of π, of the smaller cone that was removed . **(2mks)**

b) **(i)** Determine the slant height of the original cone. **(1mk)**

TRIGONOMETRY

1.

When the angle of elevation of the sun is 58^0, a vertical pole casts a shadow of length 5m on a horizontal ground. Find the height of the pole **(2mks)**

2.

The angle of elevation of the top of a cliff from point P is 45^0. From a point Q which is 10m from P towards the foot of the cliff, the angle of elevation is 48^0. Calculate the height of the cliff. **(4mks)**

3.

Towns A,B,C and D are such that A is 15km north of B,C is 8km east of B,D is directly east of A and on a bearing 060^0 from C. Find the distance between towns A and d, giving your answer to two significant figures **(3mks)**

4.

A flag 10m long is fixed on top of a tower. From a point on horizontal ground, the angles of elevation of the top and bottom of the flag post are 40^0 and 33^0 respectively.

Calculate

(a) The height of the tower **(6mks)**

(b) The shortest distance from the point on the ground to the top of the flag post **(2mks)**

5.

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 the top of the building is 45^0. Determine the angle of elevation of the top of the building from A.

(3mks)

6.

There are two signposts A and B on the edge of the road. A is 400 m to the west of b. A tree is on a bearing of 060^0 from A and a bearing of 330^0 from B Calculate the shortest distance of the tree from the edge of the road.

(3mks)

7.

A point A is directly below a window. Another point B is 15 m from A and at the same horizontal level. From B angle of elevation of the top of the bottom of the window is 30^0 and the angle of elevation of the top of the window is 35^0.

Calculate the vertical distance.

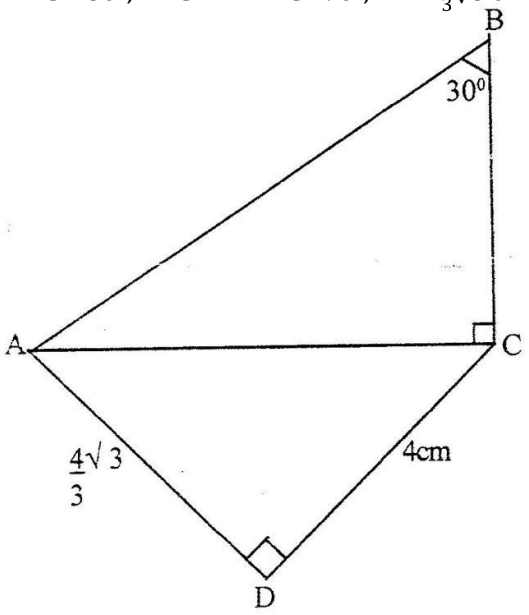
(a) From A to the top of the window **(1mk)**

(b) From A to the bottom of the window **(1mk)**

(c) From the bottom to top of the window **(1mk)**

8.

In the figure below ABC = 30^0, < ACB = <ADC= 90^0, AD = $\frac{4}{3}\sqrt{3}$ cm and DC = 4cm



Calculate the length of (a) AC **(2mks)**

(b) BC **(2mks)**

9.

Given that $\sin\theta = \frac{2}{3}$ and θ is an acute angle find:

(a) Tan θ giving your answer in surd form **(2mks)**

10.

An electric pylon is 30m high. A point S on top of the pylon is vertically above another point on the ground . Points A and B are on the same horizontal ground as R. Point A is due south of the pylon and the angle of elevation of S from A is 26^0. Point B is due west of the pylon and the angle of elevation of S from B is 32^0.

a) Distance from A and B **(6mks)**

b) Bearing B from A **(2mks)**

11.

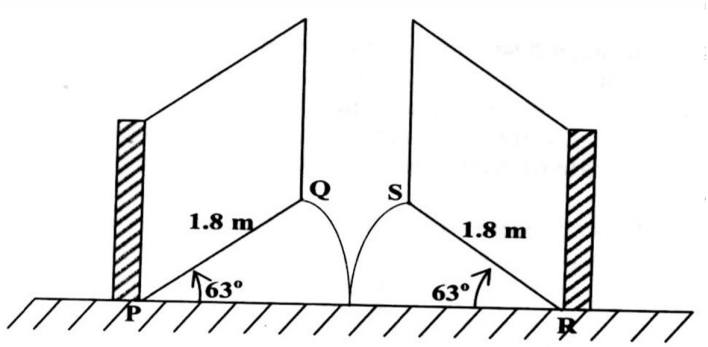
Two straight paths are perpendicular to each other at point p. One path meets a straight road at point A while the other meets the same road at B. Given that PA is 50 metres while PB is 60 metres. Calculate the obtuse angle made by path PB and the road. **(3mks)**

12.

Given that $\sin (90 - x)^0 = 0.8$, where x is an acute angle, find without using mathematical tables the value of $\tan x^0$. **(2mks)**

13.

The diagram below represents a school gate with double shutters. The shutters are such opened through an angle of 63^0.
The edges of the gate, PQ and RS are each 1.8 m



Calculate the shortest distance QS, correct to 4 significant figures **(3mks)**

14.

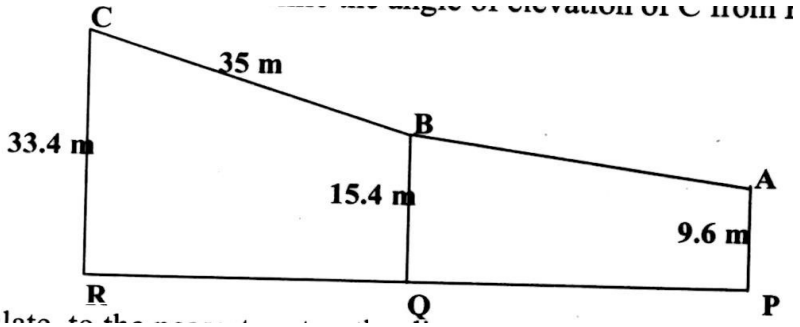
Given that x is an acute angle and $\cos x = \frac{2\sqrt{5}}{5}$ cos x = , find without using mathematical tables or a calculator, $\tan (90 - x)^0$. **(2mks)**

15.

Points L and M are equidistant from another point K. The bearing of L from K is 330^0. The bearing of M from K is 220^0.Calculate the bearing of M from L **(3mks)**

16.

In the diagram below PA represents an electricity post of height 9.6 m. QB and RC represents two storey buildings of heights 15.4 m and 33.4 m respectively. The angle of depression of A from B is 5.5^0 While the angle of elevation of C from B is 30.5^0 and BC = 35m.



(a) Calculate, to the nearest metre, the distance AB **(2mks)**

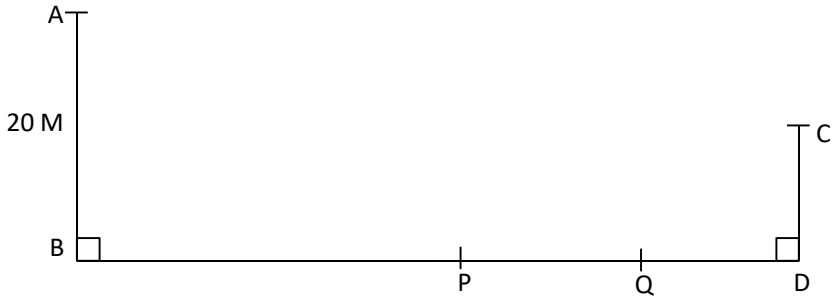
(b) By scale drawing find,

(i) The distance AC in metres **(5mks)**

(ii) $\angle$ BCA and hence determine the angle of depression of A from C **(3mks)**

17.

The diagram below represents two vertical watch-towers AB and CD on a level ground. P and Q are two points on a straight road BD. The height of the tower AB is 20m road a BD is 200m.



a) A car moves from B towards D. At point P, the angle of depression of the car from point A is 11.3^0. Calculate the distance BP to 4 significant figures. **(2mks)**

b) If the car takes 5 seconds to move from P to Q at an average speed of 36 km/h, calculate the angle of depression of Q from A to 2 decimal places **(3mks)**

c) Given that QC=50.9m, calculate;

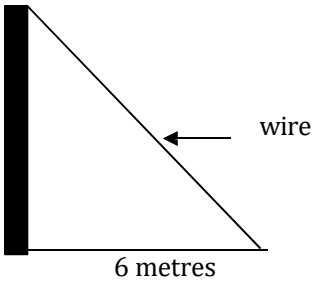
(i) The height of CD in meters to 2 decimal places; **(2mks)**

(ii) The angle of elevation of A from C to the nearest degree. **(3mks)**

18.

An electric pole is supported to stand vertically on a level ground by a tight wire.

The wire is pegged at a distance of 6 metres from the foot of the pole as shown.



The angle which the wire makes with the ground is three times the angle it makes with the pole. Calculate the length of the wire to the nearest centimetre.

(3mks)

19.

Given that $3\theta^0$ is an acute angle and $\sin 3\theta^0$, find the value of θ. **(3mks)**

20.

Given that $\sin (x + 60)^0 = \cos (2x)$, find $\tan (x + 60)^0$ **(3mks)**

21.

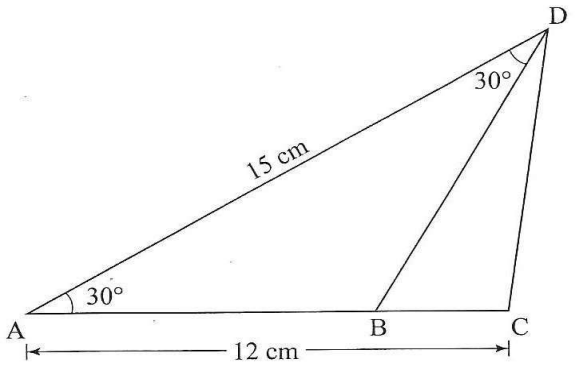
Given that $\tan x^0 = \frac{3}{7}$, find the $\cos (90 - x)^0$ giving the answer to 4 Significant figures **(2mks)**

22.

A piece of wire is bent into the shape of an isosceles triangle. The base angles are each 48° and the perpendicular height to the base is 6 cm. Calculate, correct to one decimal place, the length of the wire. **(3mks)**

23.

In the figure below, AC = 12cm, AD =15 cm and B is point on AC, <BAD= DB=30^0.



Calculate , correct to one decimal place

a) The length of CD: **(3mks)**

b) The length of AB **(3mks)**

c) The area of triangle BCD **(2mks)**

d) The size of <BDC **(2mks)**

24.

Solve the equation $\sin(\frac{1}{2}x - 30^0) = \cos x$ for $0 < x < 90^0$. **(2mks)**

MEASUREMENT

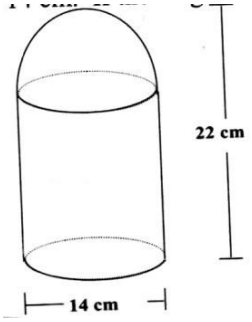
1.

The base of an open rectangular tank is 3.2m by 2.8m. Its height is 2.4m. It contains water to a depth of 1.8m. Calculate the surface area inside the tank that is not in contact with water. **(2mks)**

2.

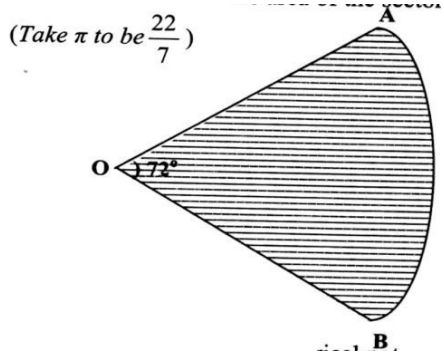
The solid shown in the figure below consists of a cylinder and a hemisphere of equal diameters of 14cm. If the height of the solid is 22cm, find its volume.

(4mks)



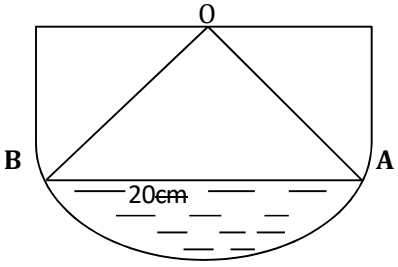
3.

The figure below shows a sector of a circle. If the area of the sector is 30.8cm^2, Calculate the length of the arc AB. (Take π to be $^{22}/_{7}$) **(3mks)**



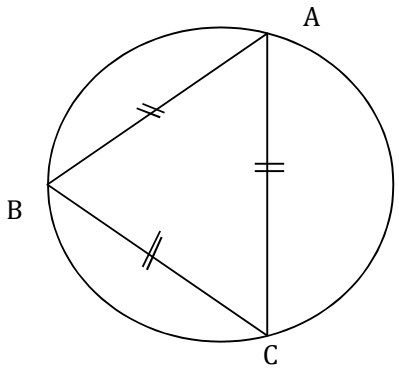
4.

The figure below shows a vertical section of a hemispherical pot centre O. The radius OA of the pot is 20cm. If the pot contains water to a depth of 8cm, calculate the diameter of the water surface. **(3mks)**



5.

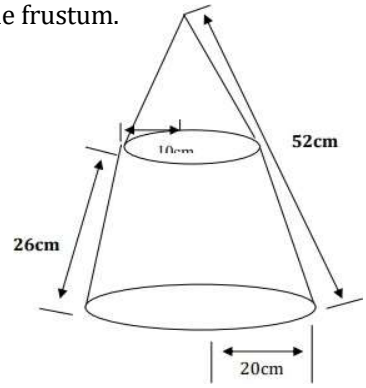
The figure below shows an equilateral triangle ABC inscribed in a circle of radius 6cm. Calculate the length of the side of the triangle. **(2mks)**



6. A metal bar 14cm long and 5cm in diameter is melted down and cast into circular washers. Each washer has an external diameter of 4cm and an internal diameter of $1\frac{1}{2}$cm and is 0.3cm thick. Calculate the number of complete washers obtained. (Take π $\frac{22}{7}$) **(4mks)**

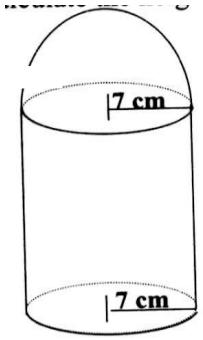
7.

A cone of radius 20cm has a slant height of 52cm. A frustum is cut off from this cone Such that its top is 10cm and its slant height is 26cm (see diagram below). Calculate the area of the curved surface of the frustum. **(3mks)**



8.

The metal solid shown in the figure below is made up by joining a hemisphere of radius 7cm to a cylinder of the same radius. The mass and density of the solid are 40kg and 17.5gm per cm3, respectively. Calculate the height of the cylindrical part of the solid**.** **(8mks)**

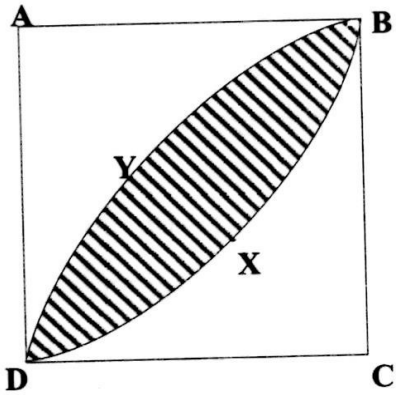


9.

The two diagonals of a parallelogram are 20cm and 28.8cm. The acute angle between them is 62^0.Calculate the of the parallelogram. **(3mks)**

10.

In the figure below, ABCD is a square of side 4cm. BXD and BYD are arcs of circles centres A and C respectively. Calculate the area of the shaded region. (Take π 3.14) **(4mks)**



11.

A room is to be constructed such that its external length and breadth are 7.5m and 5.3m respectively. The thickness of the wall is 15cm, and its height is 3.3cm. A total space of $5m^3$ is to be left out in the walls for a door and windows.

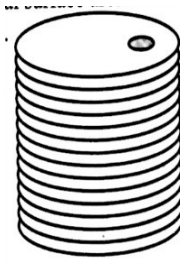
(a) Calculate the volume of the material needed to construct the walls without the door and the windows. **(4mks)**

(b) The block used in constructing the walls are 45 cm x 20cm x 15 cm. $0.225m^3$ of cement mixture is used to join the blocks. Calculate the number of blocks needed to construct the room. **(4mks)**

12.

The diagram alongside shows a model of a cylindrical water tank. The total surface area of the model is $0.4m^2$ and the surface area of the actual tank is $14.4m^2$.

(i) If the height of the tank is 2.1m, find the height of the model. **(4mks)**



ii) If the capacity of the model is 23.15litres, find the capacity of the tank to the nearest litre. **(4mks)**

13.

A swimming pool 30m long is 1m deep at its shallow end 4m deep at its deep end. The pool is 14m wide.

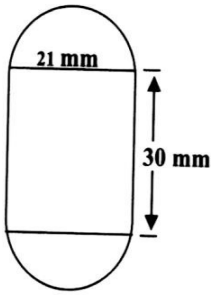
(a) Find the volume of water, in cubic metres, when the pool is full. **(4mks)**

(b) A circular pipe of diameter 14cm is used to empty the swimming pool.
Water flows through pipe at a rate of 5m per sec.
Calculate the time it would take, to the nearest minute, to empty the pool.

(4mks)

14.

The figure alongside shows the cross-section of a metal bar of length 40mm.The ends are equal semi-circles.



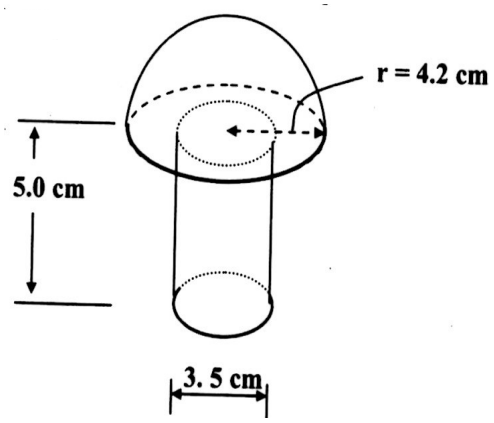
Determine its mass if the density of the metal is 8.8 g/cm^3 (Take $\pi = {}^{22}/_{7}$) **(4mks)**

15.

A rostum is made by cutting off the upper part of a cone along a plane parallel to the base at $\frac{2}{3}$ up the height. What fraction the volume of the cone does the rostum represent? **(3mks)**

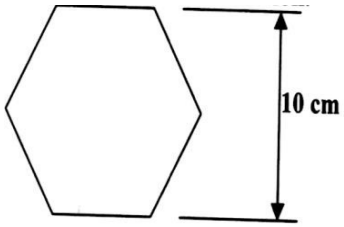
16.

A plug is made up of a hemi-spherical cap of radius 4.2cm, and a cylinder of diameter 3.5cm and height 5.0cm as shown in the diagram alongside.
Calculate the volume of the plug. **(3mks)**



17.

The cross-section of a head of a bolt is the form of a regular hexagon as shown in the figure below. Determine the area of the cross-section (4 marks)



18.

To fence one side of his farm, a farmer requires 25 posts placed 4m apart.
How many posts would he require if the posts were 3m apart? **(2mks)**

19.

A solid cone of height 12cm and radius 9cm is recast into a soli sphere.
Calculate the surface area of the sphere **(4mks)**

20.

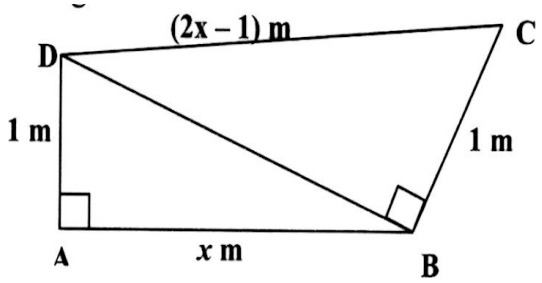
Calculate volume of a prism whose length is 25cm and whose cross- section is an equilateral triangles of 3 cm **(3mks)**

21.

Two containers, one cylindrical and one spherical, have the same volume.
The height of the cylindrical container is 50 cm and its radius is 11 cm.
Find the radius of the spherical container. **(2mks)**

22.

In the figure below BAD and CBD are right angled triangles.



Find the length of AB **(4mks)**

23. A cylinder of radius 14 cm contains water. A metal solid cone of base radius 7 cm and height 18cm is submerged into the water. Find the change in height of the water level in the cylinder. **(4mks)**

24. A metal bar is a hexagonal prism whose length is 30 cm. The cross – section is a regular hexagon with each side of the length 6 cm.

Find

(i) the area of the hexagonal face **(3mks)**

(ii) the volume of the metal bar **(2mks)**

25. A cylindrical container of radius 15cm has some water in it. When a solid is submerged into the water, the water level rises by 1.2 cm.

(a) Find, the volume of the water displaced by the solid leaving your answer in terms of π **(2mks)**

(b) If the solid is a circular cone of height 9 cm, calculate the radius of the cone to 2 decimal places. **(2mks)**

26. A cylindrical can has a hemisphere cap. The cylinder and the hemisphere are of radius 3.5 cm. The cylindrical part is 20 cm tall. Take π to be $^{22}/_{7}$

Calculate

(a) the area of the circular base **(2mks)**

(b) the area of the curved cylindrical surface **(2mks)**

(c) the area of the curved hemisphere surface **(2mks)**

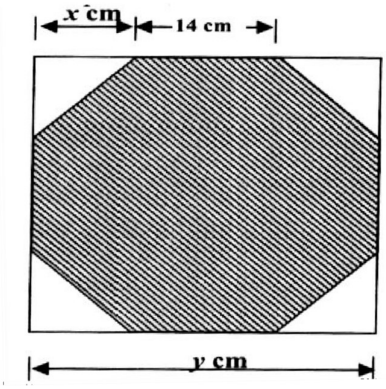
(d) The total surface area. **(2mks)**

27. A balloon, in the form of a sphere of radius 2 cm, is blown up so that the volume increase by 237.5%. Determine the new volume of balloon in terms of π **(2mks)**

28. An open right circular cone has a base radius of 5 cm and a perpendicular height of 12 cm. **(2mks)**

29.

A girl wanted to make a rectangular octagon of side 14cm. She made it from a square piece of a card of size y cm by cutting off four isosceles triangles whose equal sides were x cm each, as shown below.



(a) Write down an expression for the octagon in terms of x and y **(1mk)**

(b) Find the value of x **(1mk)**

(c) Find the area of the octagon **(1mk)**

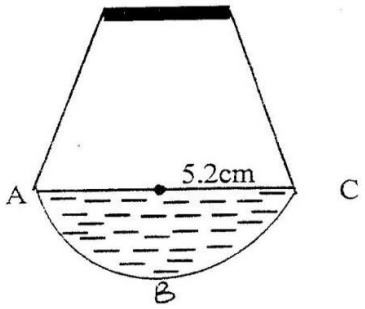
30.

An artisan has 63 kg of metal of density 7, 000kg/m^3. He intends to use to make a rectangular pipe with external dimensions 12 cm by 15 cm and internal dimensions 10 cm by 12 cm.

Calculate the length of the pipe in metres **(4mks)**

31.

The diagram below shows a cross- section of a bottle. The lower part ABC is a hemisphere of radius 5.2 cm and the upper part is a frustrum of a cone.
The top radius of the frustrum is one third of the radius of the hemisphere.
The hemisphere part is completely filled water as shown in the diagram



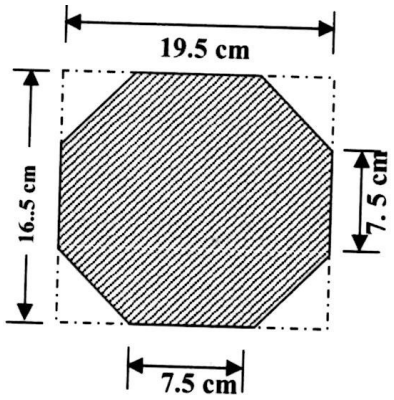
When the container is inverted, the water now completely fills only the frustrum part.

(a) Determine the height of the frustrum part **(5mks)**

(b) Find the surface area of the frustrum part of the bottle. **(3mks)**

32.

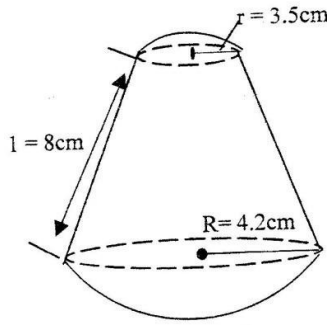
The figure below shows an octagon obtained by cutting off four congruent triangles from rectangle measuring 19.5 by 16.5 cm **(3mks)**



Calculate the area of the octagon

33.

A solid made up of a conical frustrum and a hemisphere top as shown in the figure below. The dimensions are as indicated in the figure.



(a) Find the area of

(i) The circular base **(1mk)**

(ii) The curved surface of the frustrum **(3mks)**

(iii) The hemisphere surface **(2mks)**

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

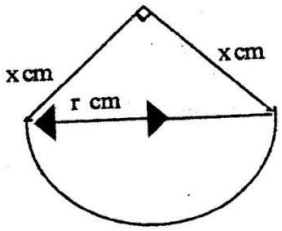
34.

Two sides of a triangle are 5 cm each and the angle between them is 120^0.

Calculate the area of the triangle. **(3mks)**

35.

A piece of wire P cm long is bent to form the shape shown in the figure below



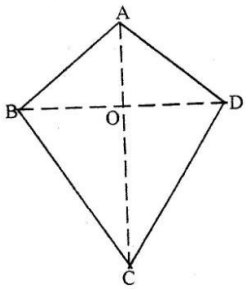
The figure consists of a semicircular arc of radius r cm and two perpendicular sides of length x cm each. Express x in terms of P and r, **(1mk)**

Hence show that the area A cm^2, of the figures is given by

$$A = \frac{1}{2}\pi r^2 + \frac{1}{8}(p - \pi r)^2$$ **(2mks)**

36.

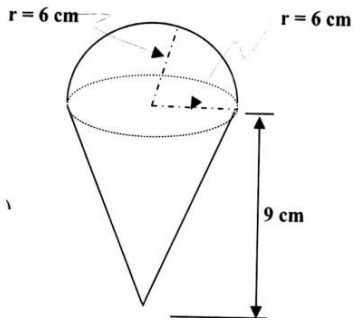
The figure below represents a kite ABCD, AB = AD = 15 cm. The diagonals BD and AC intersect at O. AC = 30 cm and AO = 12 cm.



Find the area of the kite **(3mks)**

37.

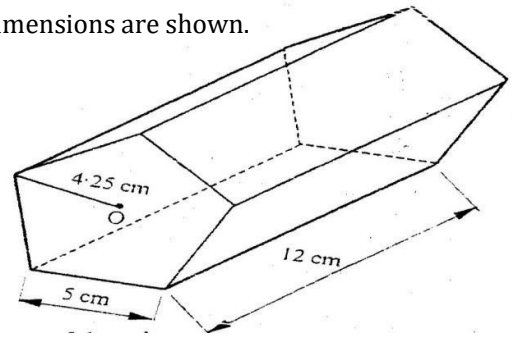
The diagram below represents a solid made up of a hemisphere mounted on a cone. The radius of the cone and the radius of the hemisphere is each 6 cm and the height of the cone is 9 cm.



Calculate the volume of the solid. Take π as $^{22}/_{7}$ **(3mks)**

38.

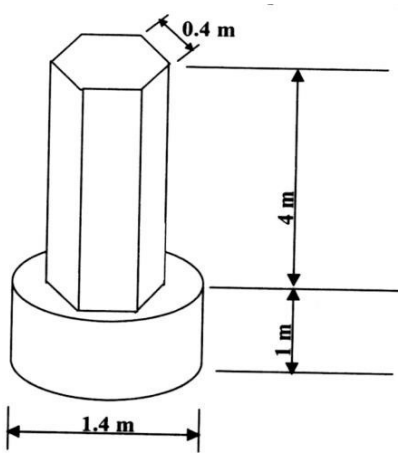
The figure represents a pentagon prism of length 12cm. The cross – section is a regular pentagon, centre O, whose dimensions are shown.



Find the total surface area of the prism. **(4mks)**

39.

The diagram below represents a pillar made of cylindrical and regular hexagonal parts. The diameter and height of the cylindrical part are 1.4m and 1m respectively. The side of the regular hexagonal face is 0.4m and height of hexagonal part is 4m.



a) Calculate the volume of the:

i) Cylindrical part **(2mks)**

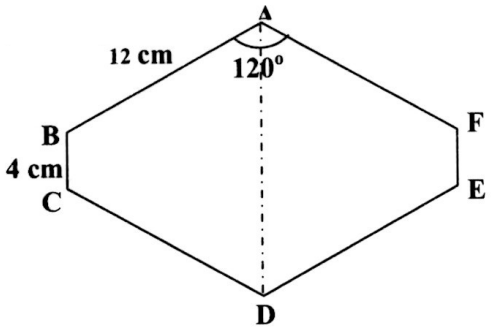
ii) Hexagonal part **(3mks)**

b) An identical pillar is to be built but with a hollow centre cross – section area of $0.25m^2$. The density of the material to be used to make the pillar is $2.4g/cm^3$.

Calculate the mass of the new pillar. **(3mks)**

40.

The figure below is a polygon in which AB = CD = FA = 12cm BC = EF = 4cm and BAF =- CDE = 120^0. AD is a line of symmetry.



Find the area of the polygon. **(4mks)**

41.

The internal and external diameters of a circular ring are 6cm and 8cm respectively.

Find the volume of the ring if its thickness is 2 millimeters. **(3mks)**

42.

A triangular flower garden has an area of $28m^2$. Two of its edges are 14 metres and 8 metres. Find the angle between the two edges. **(2mks)**

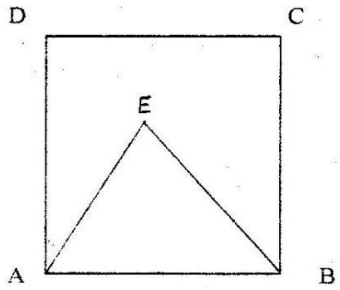
43.

The length of a solid prism is 10cm. Its cross section is an equilateral triangle of side 6cm. Find the total surface area of the prism. **(3mks)**

44.

A wire of length 21cm is bent to form the shape down in the figure below,

ABCD is a rectangle and AEB is an equilateral triangle. **(2mks)**



If the length of AD of the rectangle is $1\frac{1}{2}$ times its width, calculate the width of the rectangle.

45.

The length of a hollow cylindrical pipe is 6metres. Its external diameter is 11cm and has a thickness of 1cm. Calculate the volume in cm3 of the material used to make the pipe. Take π as 3.142. **(3mks)**

46.

A rectangular tank whose internal dimensions are 1.7m by 1.4m by 2.2m is three – quarters full of milk.

a) Calculate the volume of milk in the tank in cubic metres.

b) The milk is to be packed in small packets. Each packet is in the shape of a right pyramid on an equilateral triangular base of side 16cm.

The height of each packet is 13.6cm. Full packets obtained are sold at Sh.25 per packet.

Calculate

i) The volume of milk in cubic centimetres, contained in each packet to 2 significant figures **(4mks)**

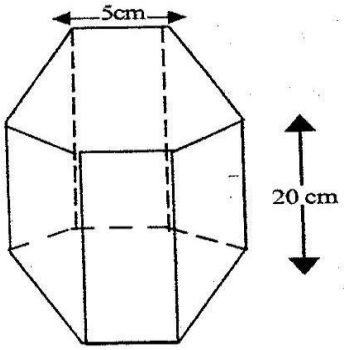
ii) The exact amount that will be realized from the sale of all the packets of milk**.** **(2mks)**

47.

The surface area of a solid hemisphere is radius r cm is 75π cm^2. Find the volume of the solid, leaving your answer in terms of π. **(4mks)**

48.

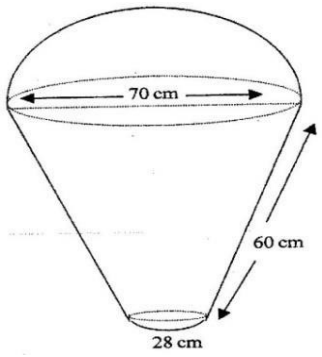
The figure below represents a hexagon of side 5cm.



Find the volume of the prism. **(4mks)**

49.

The figure below represents a model of a solid structure in the shape of a frustum of a cone with hemispherical top. The diameter of the hemispherical part is 70cm and is equal to the diameter of the top of the frustum. The frustum has a base diameter of 28cm and slant height of 60cm.



Calculate

a) The area of hemispherical surface. **(2mks)**

b) The slant height of the cone from which the frustum was cut **(2mks)**

c) The total surface area of the model. **(4mks)**

50.

The area of a rhombus is 60cm^2. Given that one of its diagonals is 15 cm long,

Calculate the perimeter of the rhombus **(3mks)**

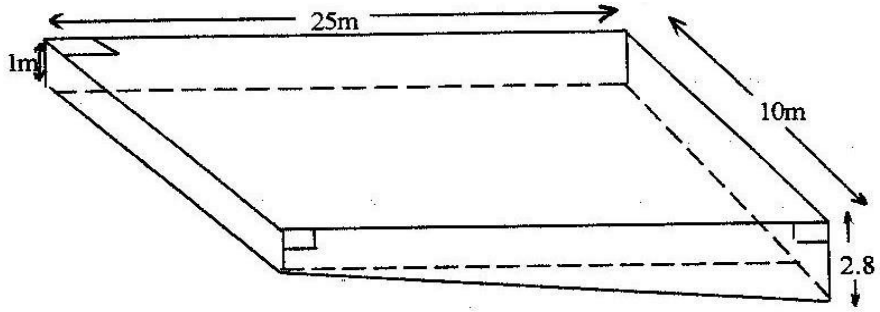
51.

A cylindrical piece of wood of radius 4.2 cm and length 150 cm is cut length into two equal pieces. Calculate the surface area of one piece

(Take π as $\frac{22}{7}$) **(4mks)**

52.

The diagram below represents a rectangular swimming pool 25m long and 10m wide. The sides of the pool are vertical.



The floor of the pool slants uniformly such that the depth at the shallow end is 1m at the deep end is 2.8 m.

(a) Calculate the volume of water required to completely fill the pool. **(3mks)**

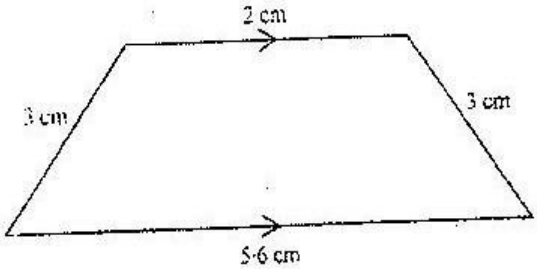
(b) Water is allowed into the empty pool at a constant rate through an inlet pipe. It takes 9 hours for the water to just cover the entire floor of the pool. Calculate:

(i) The volume of the water that just covers the floor of the pool **(2mks)**

(ii) The time needed to completely fill the remaining of the pool. **(3mks)**

53.

The diagram below (not drawn to scale) represents the cross- section of a solid prism of height 8.0 cm **(3mks)**



(a) Calculate the volume of the prism **(3mks)**

(b) Given that the density of the prism is 5.75g/cm^3, calculate its mass in grams **(2mks)**

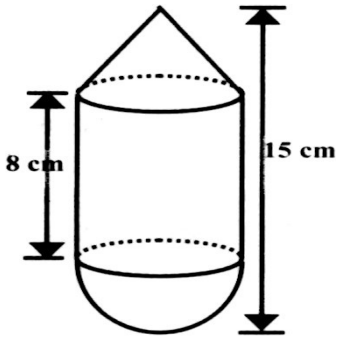
(c) A second prism is similar to first one but is made of a different materials. The volume of the second prism is 246.24cm^3

(i) Calculate the area of the cross section of the second prism **(3mks)**

(ii) Given that the ratio of the mass of the first to that of the second is 2: 5, find the density of the second prism **(2mks)**

54.

The figure below is a model representing a storage container. The model whose total height is 15cm is made up of a conical top, a hemispherical bottom and the middle part is cylindrical. The radius of the base of the cone and that of the hemisphere are each 3cm. The height of the cylindrical part is 8cm.



(a) Calculate the external surface area of the model **(4mks)**

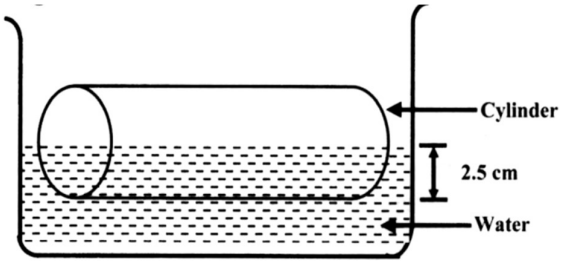
(b) The actual storage container has a total height of 6 metres. The outside of the actual storage container is to be painted. Calculate the amount of paint required if an area of 20m^2 requires 0.75 litres of the paint **(6mks)**

55.

A square brass plate is 2 mm thick and has a mass of 1.05 kg. The density of the brass is 8.4 g/cm^3. Calculate the length of the plate in centimetres **(3mks)**

56.

A cylindrical solid of radius 5 cm and length 12 cm floats lengthwise in water to a depth of 2.5 cm as shown in the figure below.



Calculate the area of the curved surface of the solid in contact with water, correct to 4 significant figures

(4mks)

57.

Two cylindrical containers are similar. The larger one has internal cross- section area of $45cm^2$ and can hold 0.945 litres of liquid when full. The smaller container has internal cross- section area of $20cm^2$

(a) Calculate the capacity of the smaller container **(4mks)**

(b) The larger container is filled with juice to a height of 13 cm. Juice is then drawn from is and emptied into the smaller container until the depths of the juice in both containers are equal.

Calculate the depths of juice in each container **(2mks)**

(c) On fifth of the juice in the larger container in part (b) above is further drawn and emptied into the smaller container. Find the difference in the depths of the juice in the two containers. **(4mks)**

58.

Mapesa travelled by train from Butere to Nairobi. The train left Butere on a Sunday at 23 50 hours and travelled for 7 hours 15 minutes to reach Nakuru.

After a 45 minutes stop in Nakuru, the train took 5 hours 40 minutes to reach Nairobi.

Find the time, in the 12 hours clock system and the day Mapesa arrived in Nairobi. **(2mks)**

59.

A liquid spray of mass 384g is packed in a cylindrical container of internal radius 3.2cm. Given that the density of the liquid is $0.6g/cm^3$, calculate to 2 decimal places the height of the liquid in the container. **(3mks)**

60.

A solid metal sphere of radius 4.2 cm was melted and the molten material used to make a cube. Find to 3 significant figures the length of the side of the cube. **(3mks)**

61.

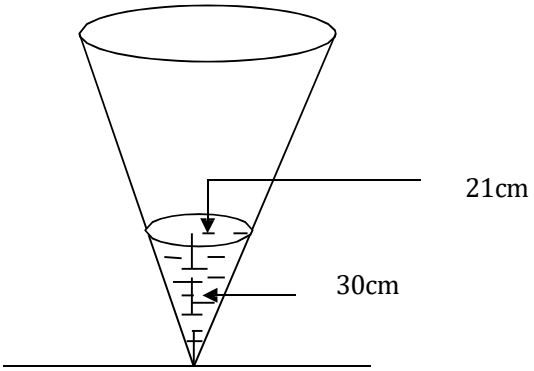
A rectangular and two circular cut-outs of metal sheet of negligible thickness are used to make a closed cylinder. The rectangular cut-out has a height of 18cm.

Each circular cut-out has a radius of 5.2cm. Calculate in terms of π, the surface area of the cylinder **(3mks)**

62.

The diagram below represents a conical vessel which stands vertically.

The which stands vertically. The vessels contains water to a depth of 30cm. The radius of the surface in the vessel is 21cm. (Take $\pi = \frac{22}{7}$).



a) Calculate the volume of the water in the vessels in cm^3

b) When a metal sphere is completely submerged in the water, the level of the water in the vessels rises by 6cm.

Calculate:

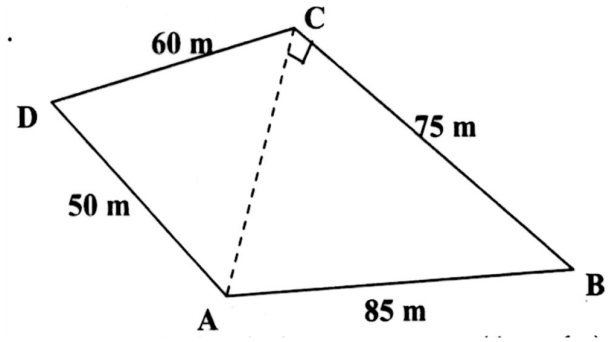
(i) The radius of the new water surface in the vessel; **(2mks)**

(ii) The volume of the metal sphere in cm^3 **(3mks)**

(iii) The radius of the sphere. **(3mks)**

63.

The figure below represents a plot of land ABCD such that AB = 85 m, BC= 75m, CD = 60m, DA=50m and angle ACB=90◦



Determine the area of the plot in hectares correct to two decimal places. **(4mks)**

64.

A watch which loses a half minute every hour was set to reach the correct time at 05 45h on Monday. Determine the time in the 12 hour system, the watch will show on the watch will show on the following Friday at 1945h. **(3mks)**

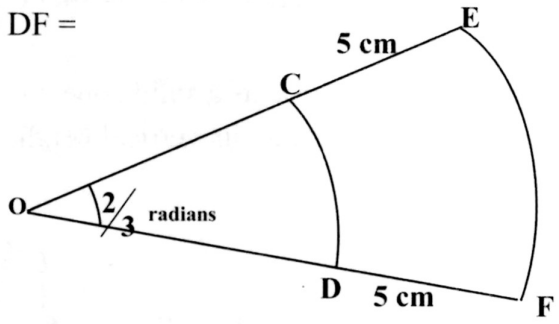
65.

A cylindrical solid whose radius and height are equal has a surface area of 154 cm^2. Calculate its diameter, correct to 2 decimal places. (Take $\pi = 3.142$).

(3mks)

66.

The figure below shows two sectors in which CD and EF are arcs of concentric circles ,centre O. Angle COD =2 radians and CE=DF= 5cm.



If the perimeter of the shape CDFE is 24 cm, calculate the length of OC.

67.

A carpenter constructed a closed wooden box with internal Measurements 1.5 metres long,0.8 metres wide and 0.4 metres high. The wood used in constructing the box was 10 cm thick and had a density of 0.6 g/cm^3.

a). Determine the:

(i) Volume in cm^3,of the wood used in constructing the box **(4mks)**

(ii) Mass of the box in kilograms, correct to 1 decimal place. **(2mks)**

b). Identical cylindrical tins of diameter 10 cm, height 20 cm with a mass of 120 g each were packed in the box. Calculate the:

(i) Maximum number of tins that were packed. **(2mks)**

(ii) Total mass of the box with the tins. **(2mks)**

68.

The diagonal of a rectangular garden measures $11\frac{1}{4}$m while its width measures $6\frac{3}{4}$ m. Calculate the perimeter of the garden. **(2mks)**

69.

The external length, width and height of an open rectangular container are 41 cm, 21 cm and 15.5cm respectively. The thickness of the material making the container is 5mm. If the container has 8 litres of water, calculate the internal height above the water level. **(4mks)**

70.

A solid consists of a cone and a hemisphere. The common diameter of the Cone and the hemisphere is 12cm and the slanting height of the cone is 10cm.

a) Calculate correct to two decimal places;

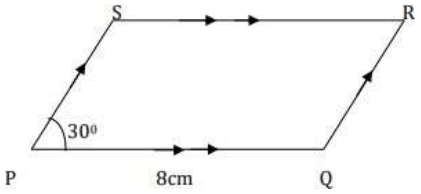
i) The surface area of the solid; **(3mks)**

ii) The volume of the solid. **(4mks)**

b) If the density of the material used to make the solid is 1.3g/cm^3, calculate its mass in kilograms. **(3mks)**

71.

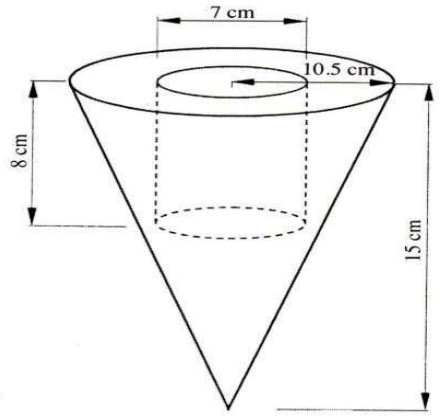
In the parallelogram PQRS shown below, PQ=8cm and angle SPQ = 30^0



If the area of the parallelogram is 24cm^3, find its perimeter. **(3mks)**

72.

The figure below represents a solid cone with a cylindrical hole drilled into it. The radius of the cone is 10.5cm an its vertical height is 15cm.The hole has a diameter of 7cm and depth of 8cm.

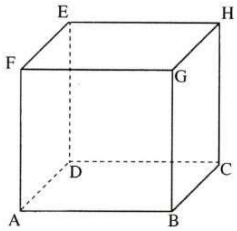


Calculate the volume of the solid. **(3mks)**

73.

The figure below represents a solid cuboid ABCDEFGH with a rectangular base.

AC = 13cm, BC = 5cm and CH = 15cm.



(a) Determine the length of AB. **(1mk)**

(b) Calculate the surface area of the cuboid **(3mks)**

(c) Given that the density of the material used to make the cuboid is 7.6g/cm^3, calculate its mass in kilograms. **(4mks)**

(d) Determine the number of such cuboids that can fit exactly in a container measuring 1.5m by 1.2m by 1m. **(2mks)**

74.

Chelimo's clock loses 15 seconds every hour. She sets the correct time on the clock at 0700h on a Monday. Determine the time shown on the clock when the correct time was 1900h on Wednesday the same week. **(3mks)**

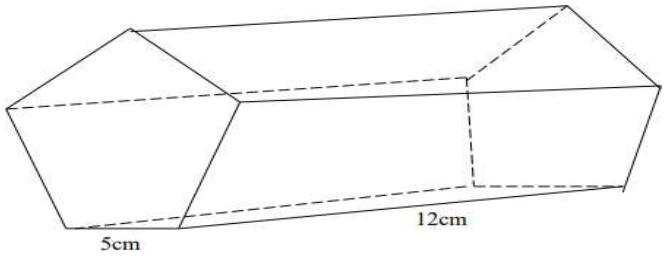
75.

A cylindrical pipe 2 ½ metres long has an internal diameter of 21 millimetres and an external diameter of 35 millimetres. The density of the material that makes the pipe is 1.25 g/cm^3.

Calculate the mass of mass of the pipe in kilograms. (Take $\pi = \frac{22}{7}$). **(4mks)**

76.

The figure below represents a pentagonal prism of length 12 cm.The cross-section is a regular pentagon of side 5 cm.



Calculate the surface area of the prism correct to 4 significant figures. **(4mks)**

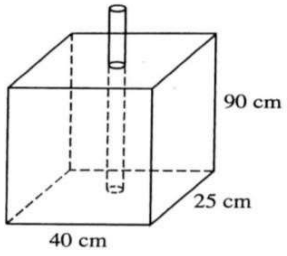
77.

The mass of solid cone of radius 14cm and height 18cm is 4.62kg.

find its density in g/cm^3 **(3mks)**

78.

The figure below shows a rectangular container of dimensions 40cm by 25cm by 90cm. a cylindrical pipe of radius 7.5cm is fitted in the container as shown.



Water is poured into the container in the space outside the pipe such that the water level is 80% the height of the container. Calculate the amount of the water, in litres, in the container in 3 significant figures. **(4mks)**

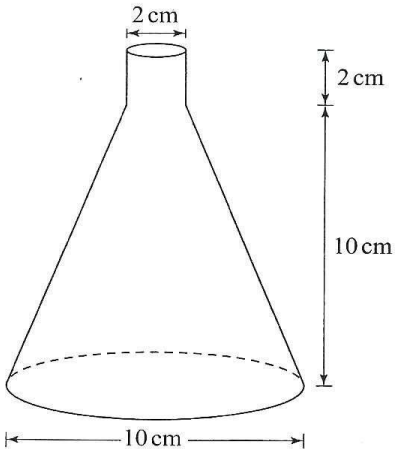
79.

A minor arc of a circle subtends an angle of 1050 at the centre of the circle. If the radius of the circle is 8.4cm, find the length of the major arc (take $= \frac{22}{7}$) **(3mks)**

80.

The volume of a cube is 1728 cm^3. Calculate, correct to 2 decimal places, the length of the diagonal of a face of the cube. **(3mks)**

81. The figure below represents a conical flask. The flask consists of a cylindrical part and a frustum of a cone. The diameter of the base is 10cm while that of the neck is 2 cm. the vertical height of the flask is 12cm.



Calculate, correct to 1 decimal place

a) The slant height of the frustum part **(2mks)**

b) The slant height of the smaller cone that was cut off to make the frustum part **(2mks)**

c) The external surface area of the flask. (Take $\pi = 3.142$) **(6mks)**

82.

An arc 11 cm long, subtends an angle of 70° at the centre of a circle. Calculate the length, correct to one decimal place, of a chord that subtends an angle of 90° at the centre of the same circle. **(4mks)**

ALGEBRAIC EXPRESSIONS

1.

Factorize completely $a^2 - 15ab + 36b^2$ **(2mks)**

2.

Simplify **(3mks)**

$$\frac{(6a+b)(a+b)-7b(a+b)}{2a^2-2b^2}$$

3.

Simplify $\frac{a}{2(a+b)} + \frac{b}{2(a-b)}$ **(3mks)**

4.

If the expression $25y^2 - 70y + d$ is a perfect square, where d is a constant, find the value of d. **(3mks)**

5.

Factorize $2x^2y^2 - 5xy - 12$ **(3mks)**

6.

Simplify $\frac{x-2}{x+2} + \frac{2x+20}{x^2-4}$ **(4mks)**

7.

Simplify $28x^2 + 3x - 1$ **(2mks)**

8.

Simplify **(3mks)**

$$\frac{2x-2}{6x^2-x-12} \div \frac{x-1}{2x-3}$$

9.

Simplify completely

$$\frac{3x^2-1}{x^2-1} - \frac{2x+1}{x+1}$$

10.

Factorize completely

$3x^2 - 2xy - y^2$ **(2mks)**

11.

Find the greatest common factor of x^3y^2 and $4xy^4$. Hence factorize completely the expression $x^3y^2 - 4xy^4$ **(3mks)**

12

Factorize $a^2 - b^2$

Hence find the exact value of $2557^2 - 2547^2$ **(2mks)**

13.

Simplify the expression

$$5a - 4b = 2\,[a - (2b + c)]$$ **(2mks)**

14.

By substituting y for (2-a) or otherwise simplify the expression

$(x + 2 - a)^2 + (2 - a - x)^2 - 2(x - 2 + a)(x + 2 - a)$. **(3mks)**

Give your answer in terms of a and as a product of two squares.

15.

If $x^2 + y^2 = 29$ and $x + y = 3$

(a) Determine the values of

(i) $x^2 + 2xy + y^2$ **(1mk)**

(ii) $2xy$ **(1mk)**

(iii) $x^2 - 2xy + y^2$ **(1mk)**

(iv) $x - y$

(b) Find the value of x and y **(3mks)**

16. Simplify the expression $\dfrac{3a^2+4ab+b}{4a^2+3ab-b^2}$ **(3mks)**

17.

Simplify the expression $\dfrac{3x^2 - 4xy - y^2}{9x^2 - y^2}$

18.

Simplify: $(x + 2y)^2 - (x - 2y)^2$ **(3mks)**

19.

Simply the expression $\dfrac{4x^2 - y^2}{2x^2 - 7xy + 3y^2}$

20.

Simplify the expression $\left(a + \frac{1}{b}\right)^2 - \left(a - \frac{1}{b}\right)^2$ **(3mks)**

21.

Simplify the expression $\frac{2a^2-3ab-2b^2}{4a^2-b^2}$

22.

Simplify the expression $\frac{9t^2-25a^2}{6t^2+19at+15a^2}$ **(3mks)**

23.

Simplify $\frac{p^2+2pq+q^2}{p^3-pq^2+p^2q-q^3}$ **(4mks)**

24.

Expand the expression

$(x^2-y^2)(x^2+y^2)(x^4-y^4)$ **(2mks)**

25.

Simplify the expression $\frac{15a^2b-10ab^2}{3a^2-5ab+2b^2}$ **(3mks)**

26.

Simplify the expression $\frac{a^4-b^4}{a^3-ab^2}$ **(3mks)**

27.

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

28.

Simplify the expression $\frac{x^2+x-4xy-4x}{(x+1)(4xy^2-xy)}$ **(3mks)**

29. **2011 Q 6 P1**

Simplify the expression: $\frac{4x-9x^3}{3x^2-4x-4}$ **(3mks)**

30.

Factorise

$2x^2y^2 - 5xy - 12$ **(2mks)**

31.

Expand and simplify the expression

$(2x^2 - 3y^3)^2 + 12x^2y^3$ **(2mks)**

32.

Simplify the expression:

$$\frac{16m^2-9n^2}{4m^2mn-3n^2}$$ **(3mks)**

33.

Expand and simplify $(x + 2y)^2 - (2y - 3)^2$ **(2mks)**

34.

Given that $a = 3$, $b = 5$ and $c = -\frac{1}{2}$ evaluate $\frac{4a^2+2b-4c}{\frac{1}{4}(b^2-3a)}$ **(3mks)**

LINEAR INEQUALITIES

1.

Find the range of x if $2 \leq 3 - x < 5$ **(2mks)**

2.

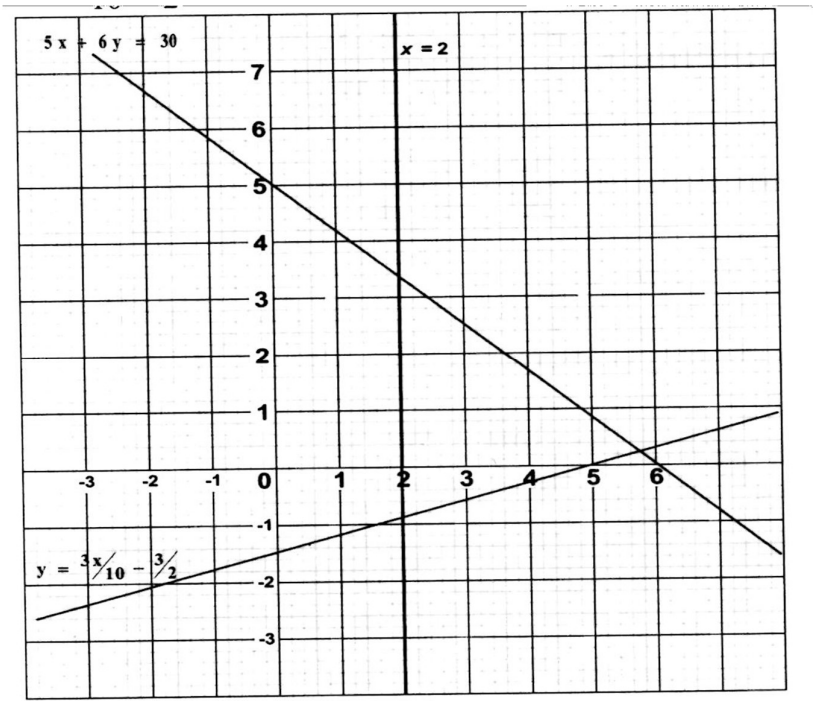
Find all the integral value of x which satisfy the inequalities

$2(2-x) < 4x - 9 < x + 11$ **(3mks)**

3.

The diagram below shows the graph of:

$y = \frac{3}{10}x - \frac{3}{2}$, $5x + 6y = 30$ and $x = 2$



By shading the unwanted region, determine and label the region R that satisfies the three inequalities. $y \geq \frac{3}{10}x - \frac{3}{2}$, $5x + 6y \geq 30$ and $x \geq 2$ **(4mks)**

4.

Solve the following inequalities and represent the solutions on a single number line:

$3 - 2x < 5$

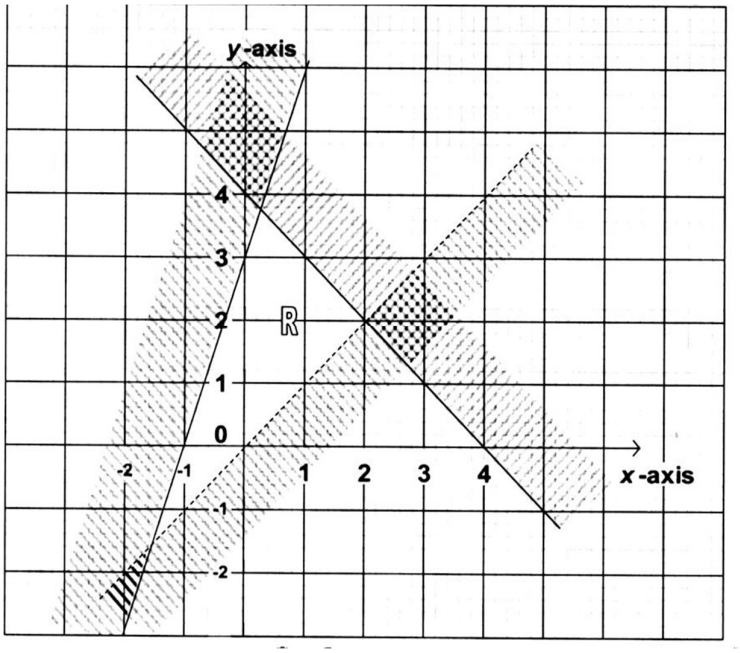
$4 - 3x \geq -8$ **(3mks)**

5.

A mixed school can accommodate a maximum of 440 students. The number of girls must be at least 120 while the number of boys must exceed 150. Taking x to represent the number of boys and y the number of girls, write down all the inequalities representing the information above. **(3mks)**

6.

Form the three inequalities that satisfy the given region R.



7.

Solve the inequality $3 - 2x \angle x \leq \frac{2x+5}{3}$ and show the solution on the number line **(4mks)**

8.

The sum of three consecutive odd integers is greater than 219.Determine the first three such integers. **(3mks)**

9.

a) Solve the inequalities $2x - 5 > -11$ and $3 + 2x \leq 13$, giving the answer as a combined inequality. **(3mks)**

b) List the integral values of x that satisfy the combined inequality in (a) above **(1mk)**

10.

Given the inequalities $x - 5 \leq 3x - 8 < 2x - 3$.

a) Solve the inequalities; **(2mks)**

b) Represent the solution on a number line. **(1mk)**

11.

Solve $4 \leq 3x - 2 < 9 + x$ hence list the integral value that satisfies the inequality. **(3mks)**

LINEAR MOTION

1.

Two towns T and S are 300km apart. Two buses A and B started from T at the same time travelling towards S. Bus B, travelling at an average speed of 10kmh^{-1} greater than that of A reached S $1^1/_4$ hours earlier.

(a) Find the average speed of A **(6mks)**

(b) How far was A from T when B reached S **(2mks)**

2.

Mwangi and Otieno live 40km apart. Mwangi starts from his home at 7.30 am and cycles towards Otieno's house at 16km/h. Otieno starts from his home at 8.00am and cycles at 8km/h towards Mwangi. At what time do they meet? **(4mks)**

3.

A vehicle moves at an initial speed of 20m/s with a constant acceleration of 2m/s^2 for five seconds before brakes are applied. If the car comes to rest under constant deceleration in 4 seconds, determine the total distance travelled during the 9 seconds **(3mks)**

4.

A minibus covered a distance of 180km at an average speed of 90km/hr. It travelled at a sped of 80km/hr for $^2/_3$ of its journey. At what speed did it travel the remaining part of the journey **(3mks)**

5.

In a race, Ogot, running at a constant speed of 8m/s, is 5m ahead of Ondiek maintains a constant speed of 10m/s, how far does Ondiek run before catching up with Ogot? **(3mks)**

6.

A bus takes 195 minutes to travel a distance of (2x + 30) km at an average speed of (x – 20) km/h

Calculate the actual distance traveled. Give your answers in kilometres. **(3mks)**

7.

Two lorries A and B ferry goods between two towns which are 3120 km apart. Lorry A travelled at 5 km/h faster than lorry B and B takes 4 hours more than lorry A to cover the distance.

Calculate the speed of lorry B **(5mks)**

8.

Two towns P and Q are 400 km apart. A bus left P for Q. It stopped at Q for one hour and then started the return journey to P. One hour after the departure of the bus from P, a trailer also heading for Q left P. The trailer met the returning bus ¾ of the way from P to Q. They met t hours after the departure of the bus from P.

(a) Express the average speed of the trailer in terms of t **(1mk)**

(b) Find the ration of the speed of the bus so that of the trailer. **(2mks)**

9.

The athletes in an 800 metres race take 104 seconds and 108 seconds respectively to complete the race. Assuming each athlete is running at a constant speed.
Calculate the distance between them when the faster athlete is at the finishing line. **(2mks)**

10.

A and B are towns 360 km apart. An express bus departs form A at 8 am and maintains an average speed of 90 km/h between A and B. Another bus starts from B also at 8 am and moves towards A making four stops at four equally spaced points between B and A. Each stop is of duration 5 minutes and the average speed between any two spots is 60 km/h.
Calculate distance between the two buses at 10 am. **(3mks)**

11.

Two towns A and B are 220km apart. A bus left town A at 11. 00am and travelled towards B at 60 km/h. At the same time, a matatu left town B for town A and travelled at 80 km/h. The matatu stopped for a total of 45 minutes on the way before meeting the bus.

Calculate the distance covered by the bus before meeting the matatu.

(3mks)

12.

A passenger noticed that she had forgotten her bag in a bus 12 minutes after the bus had left. To catch up with the bus, she immediately took a taxi which travelled at 95 km/h.
The bus maintained an average speed of 75 km/h. Determine

a) The distance covered by the bus in 12 minutes **(1mk)**

b) The distance covered by the taxi to catch up with the bus **(2mks)**

13.

A town N is 340 km due west of town G and town K is due west of town N. A helicopter Zebra left G for K at 9.00 am. Another helicopter Buffalo left N for K at 11.00 am. Helicopter Buffalo travelled at an average speed of 20 km/ h faster than Zebra. If both helicopters reached K at 12.30 pm find the speed of helicopter Buffalo.

(3mks)

14.

A train moving at an average speed of 72km/h takes 15 seconds to completely cross a bridge that is 80 metres long.

a) Express 72km/h in metres per second **(1mk)**

b) Find the length of the train in metres **(2mks)**

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Two trains T_1 and T_2 travelling in the opposite directions, on parallel tracks are just beginning to pass one another. Train T_1 is 72 m long and travelling at 108 km/h. T_2 is 78 m long and is travelling at 72 km/h.

Find the time, in seconds, the two trains take to completely pass one another

16.

The distance between towns M and N is 280 km. A car and a lorry travel from M to N. The average speed of the lorry is 20 km/h less than that of the car. The lorry takes 1 h 10 min more than the car to travel from M and N.

(a) If the speed of the lorry is x km/h, find x **(5mks)**

(b) The lorry left town M at 8: 15 a.m. The car left town M and overtook the lorry at 12.15 p.m . Calculate the time the car left town M. **(3mks)**

17.

A bus left Mombasa and travelled towards Nairobi at an average speed of 60km/hr. after $2^1/_2$ hours; a car left Mombasa and travelled along the same road at an average speed of 100km/ hr. If the distance between Mombasa and Nairobi is 500km, Determine

(a) (i) The distance of the bus from Nairobi when the car took off **(2mks)**

(ii) The distance the car travelled to catch up with the bus **(4mks)**

(b) Immediately the car caught up with the bus, the car stopped for 25 minutes. Find the new average speed at which the car travelled in order to reach Nairobi at the same time as the bus. **(4mks)**

18.

A rally car travelled for 2 hours 40 minutes at an average speed of 120km/h.

The car consumes an average of 1 litre of fuel for every 4 kilometres.

A litre of the fuel costs Kshs 59

Calculate the amount of money spent on fuel **(3mks)**

19.

Two policemen were together at a road junction. Each had a walkie talkie. The maximum distance at which one could communicate with the other was 2.5 km. One of the policemen walked due East at 3.2 km/h while the other walked due North at 2.4 km/h the policeman who headed East travelled for x km while the one who headed North travelled for y km before they were unable to communicate.

(a) Draw a sketch to represent the relative positions of the policemen. **(1mk)**

(b) (i) From the information above form two simultaneous equations in x and y. **(2mks)**

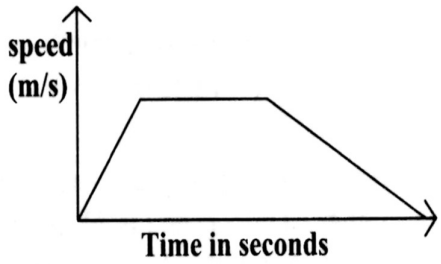
20.

A bus travelling at an average speed of 63km/h left a station at 8.15 a.m.

A car later left the same station at 9.00 a.m. and caught up with the bus at 10.45 a.m. Find the average speed of the car. **(3mks)**

21.

The diagram below shows the time graph for a train travelling between two stations. The train starts from rest and accelerates uniformly for 150 seconds. It then travels at a constant speed for 300 seconds and finally decelerates uniformly for 200 seconds.



Given that the distance between the two stations is 10 450m, calculate the:

(a) maximum speed , in Km/h the train attained **(3mks)**

(b) acceleration **(2mks)**

(c) distance the train travelling during the last 100 seconds **(2mks)**

(d) time the train takes to travel the first half of the journey **(3mks)**

22.

A bus left a petrol station at 9.20 a.m and y travelled at an average speed of 75 km/h to a town N. At 9.40 a.m a taxi travelling at an average speed of 95 mk/h, left the same petrol station and followed the route of the bus. Determine the distance, from the petrol station, covered by the taxi at the time it caught up with the bus. **(3mks)**

23.

A motorist took 2 hours to travel from one town to another town and 1 hour 40 minutes to travel back. Calculate the percentage change in the speed of the motorist. **(3mks)**

24.

Makau made a journey of 700 km partly by train and partly by bus. He started his journey at 8.00 am. By train which traveled at 50km/h. After alighting from the train, he took a lunch break of 30 minutes. He then continued his journey by bus which traveled at 75km/h. The whole journey took $11^1/_4$ hours.

a) Determine

(i) the distance travelled by bus **(4mks)**

(ii) the time Makau started traveling by bus **(3mks)**

b) The bus developed a puncture after traveling $187^1/_2$ km. It took 15 minutes to replace the wheel.

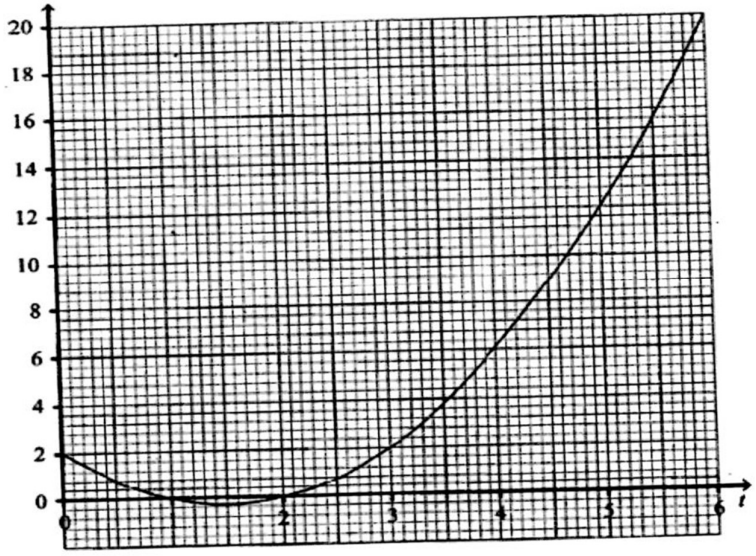
Find the time taken to complete the remaining part of the journey **(3mks)**

25.

Koech left home to a shopping centre 12km away, running at 8km/h. Fifteen minutes later, Mutua left the same home an cycled to the shopping centre at 20km/h.Calculate the distance to the shopping centre at which Mutua caught up with Koech**.** **(3mks)**

26.

The graph below shows the relationship between distance s metres and time t seconds in the interval $0 \leq t \leq 6$



Use the graph to determine:

(a) The average rate of change of distance between t=3 seconds and t-6 seconds **(2mks)**

(b) The gradient at t-3 secs **(2mks)**

27.

Two towns, A and B are 80km apart. Juma started cycling from town A to town B at 10.00 am at an average speed of 40 km/h. Mutuku started his journey from town B to town A at 10.30 am and travelled by car at an average speed of 60 km/h.

a) Calculate:

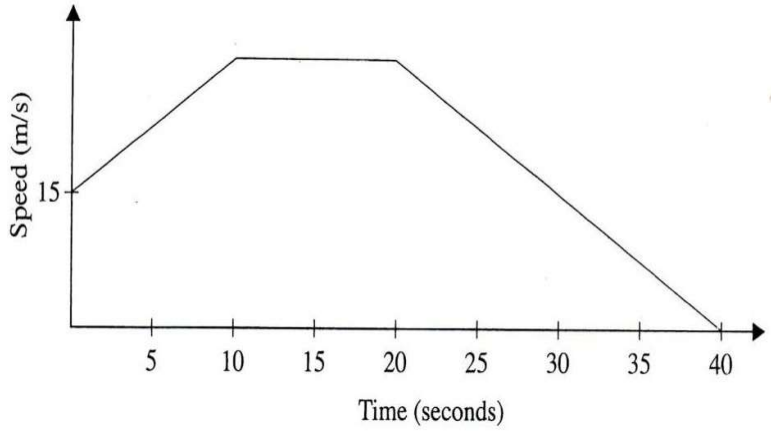
i. The distance from town A when Juma and Mutuku met; **(5mks)**

ii. The time of the day when the two met. **(2mks)**

b) Kamau started cycling from town A to town B at 10.21 am. He met Mutuku at the same time as Juma did. Determine Kamau's average speed. **(3mks)**

28.

The figure below represents a speed time graph for a cheetah which covered 825m in 40 seconds.



(a) State the speed of the cheetah when recording of its motion started **(1mk)**

(b) Calculate the maximum speed attained by the cheetah **(3mks)**

(c) Calculate the acceleration of the cheetah in:

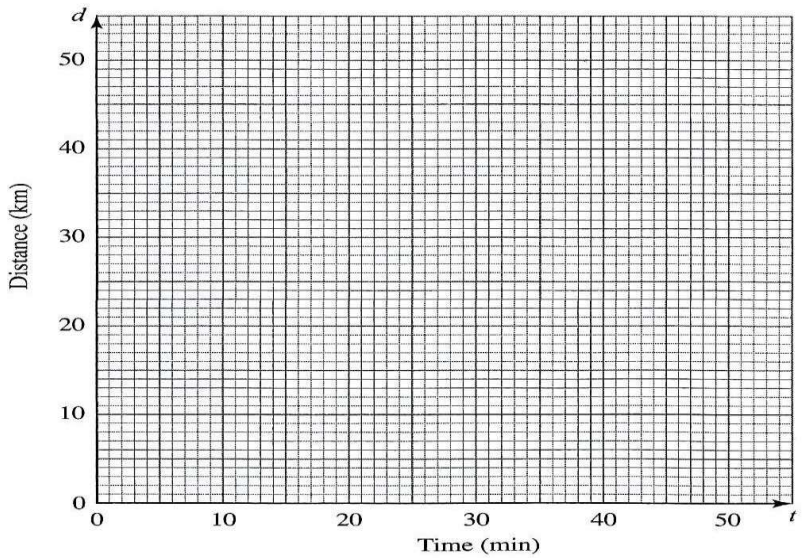
(i) The first 10 seconds **(2mks)**

(ii) The last 20 seconds **(1mk)**

(d) Calculate the average speed of the cheetah in first 20 seconds **(3mks)**

29.

Musa cycled from his home to a school 6km away in 20 minutes. He stopped at the school for 5 minutes before taking a motorbike to a town 40km away. The motorbike travelled at 75km/h. On the grid provided, draw a distance-time graph to represent Musa's journey. **(3mks)**



30.

Mute cycled to raise funds for a charitable organisation. On the first day, he cycled 40 km. For the first 10 days, he cycled 3 km less on each subsequent day. Thereafter, he cycled 2km less on each subsequent day.

a) calculate

i) the distance cycled on the 10^{th} day **(2mks)**

ii) The distance cycled on the 16^{th} day **(3mks)**

b) If Mute raised kshs 200 per km, calculate the amount of money collected **(5mks)**

STATISTICS I

1.

The shoe sizes for 40 pupils in a class were recorded as shown in the table below

Shoe size	4	5	6	7	8	9
Number of pupils	1	4	18	14	2	1

Determine the mean shoe size in the class **(2mks)**

2.

The height in centimeters of 60 children attending a clinic were recorded as follows:

Height (cm)	33-35	36-38	39-41	42-44	45-47	48-50	51-53	54-56
No. of children	1	3	14	15	16	8	2	1

Calculate the median height **(3mks)**

3.

The mean age of 15 boys in a class is 19 years. On a day when one of the boys was absent, the rest gave their ages as follows:

20, 22, 16, 18, 17, 21, 18, 20, 17, 18, 19, 20, 19, 21.

Find the age of the absent boy **(3mks)**

4.

Every week the number of absentees in a school was recorded. This was done for 39 weeks these observations were tabulated as shown below

Number of absentees	0.3	4 -7	8 -11	12 - 15	16 - 19	20 - 23
(Number of weeks)	6	9	8	11	3	2

Estimate the median absentee rate per week in the school **(2mks)**

5.

The following enrolment figures for twenty primary schools were collected.

934	923	936	931	924	933	933	937	926	923
934	931	929	934	927	927	932	934	927	940

(a) Determine the mode **(1mk)**

(b) The differences from an assumed mean were obtained and rearranged as follows.

-2	-2	-1	1	2	2	2	4	6	6
7	8	8	9	9	9	9	11	12	15

(i) Determine the assumed mean. **(1mk)**

(ii) Use the assumed mean in (b)(i) to find the mean enrolment. **(2mks)**

6.

Six weeks after planting the height of bean plants were measured correct to the nearest centimetre. The frequency distribution is given in the table below.

Height (x)	$0 \leq x \leq 4$	$4 \leq x \leq 8$	$8 \leq x \leq 12$	$12 \leq x \leq 16$	$16 \leq x \leq 20$
Frequency	3	8	19	14	6
Cumulative Frequency					

(a) Enter the cumulative frequency values in the above table **(1mk)**

(b) Estimate the median height of the plants **(2mks)**

7.

The number of people who attended an agricultural show in one day was 510 men, 1080 women and some children. When the information was represented on a pie chart, the combined angle for the men and children was 2160. Find the angle representing the children. **(3mks)**

8.

Patients who attend a clinic in one week were grouped by age as shown in the table below:

Age x years	$0 \leq x < 5$	$5 \leq x < 15$	$15 \leq x$ 25	$25 \leq x < 45$	$45 \leq x < 75$
No. of patients	14	41	59	70	15

i. Estimate the mean age **(4mks)**

ii. On the grid provided draw a histogram to represent the distribution

1 cm to represent 5 unit on the horizon axis

2 cm to represent 5 units on the vertical axis **(4mks)**

9.

The table below shows heights of 50 students

Height (cm)	Frequency
140 – 144	3
145 – 149	15
150- 154	19
155- 159	11
160-164	2

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

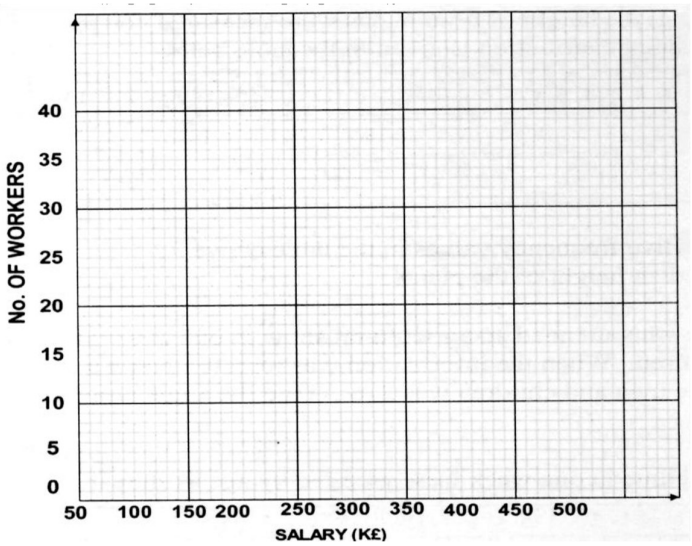
(b) Calculate the median height **(2mks)**

10.

The frequency distribution table below shows the weekly salary (K£) paid to workers in a factory

Salary (K£)	50 ≤ x < 100	100≤ x <150	150≤ x < 25	250 ≤ x <350	350≤ x <500
No. of workers	13	16	38	24	9

On the grid provided draw a histogram to respect the information shown above



11.

The table below shows the number of goals scored by a football team in 20 matches

Goals scored	0	1	2	3	4	5
Number of matches	5	6	4	3	1	1

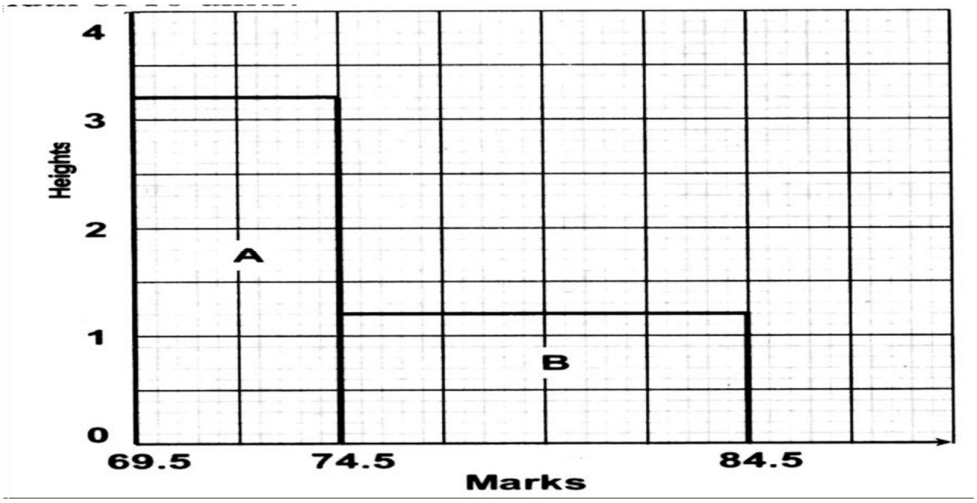
Find:

a) The mode **(1mk)**

b) The mean number of goals **(2mks)**

12.

The histogram below represents the distribution of marks obtained in a test.



The bar marked A has a height of 3.2 units and a width of 5 units. The bar marked B has a height of 1.2 units and a width of 10 units

If the frequency of the class represented by bar B is 6, determine the frequency of the class represented by bar A.

13.

A frequency distribution of marks obtained by 120 candidates is to be represented in a histogram. The table below shows the grouped marks. Frequencies for all the groups and also the area and height of the rectangle for the group 30 – 60 marks.

Marks	0-10	10-30	30-60	60-70	70-100
Frequency	12	40	36	8	24
Area of rectangle			180		
Height of rectangle			6		

(a) (i) Complete the table **(4mks)**

(ii) On the grid provided below, draw the histogram **(2mks)**

(b) (i) State the group in which the median mark lies **(1mk)**

(ii) A vertical line drawn through the median mark divides the total area of the histogram into two equal parts

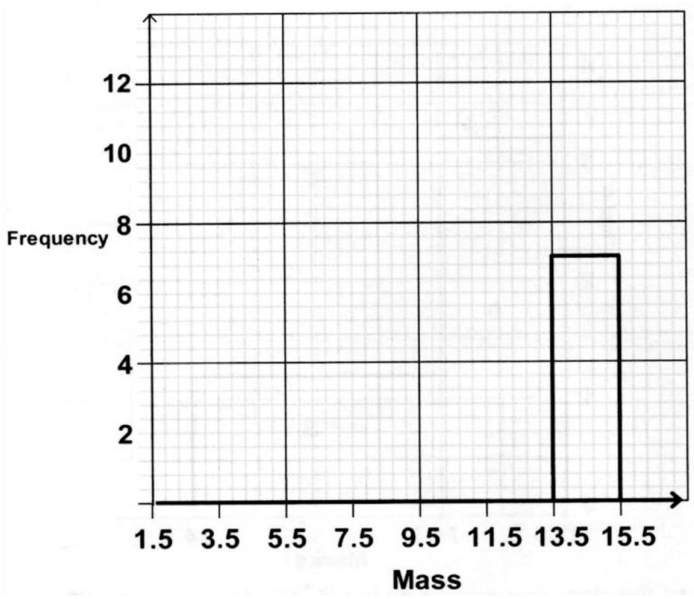
Using this information or otherwise, estimate the median mark **(3mks)**

14.

The following data was obtained for the masses of certain animals.

Mass (x kg)	Frequency
$1.5 \leq x < 5.5$	16
$5.5 \leq x\ 7.5$	20
$7.5 \leq x < 13.5$	18
$13.5 \leq x < 15.5$	14

Complete the histogram on the grid provided below: **(3mks)**



15.

The marks scored by a group of pupils in a mathematics test were as recorded in the table below.

Marks	Frequency
0-9	1
10-19	2
20-29	4
30-39	7
40-49	10
50-59	16
60-69	20
70-79	6
80-89	3
90-99	1

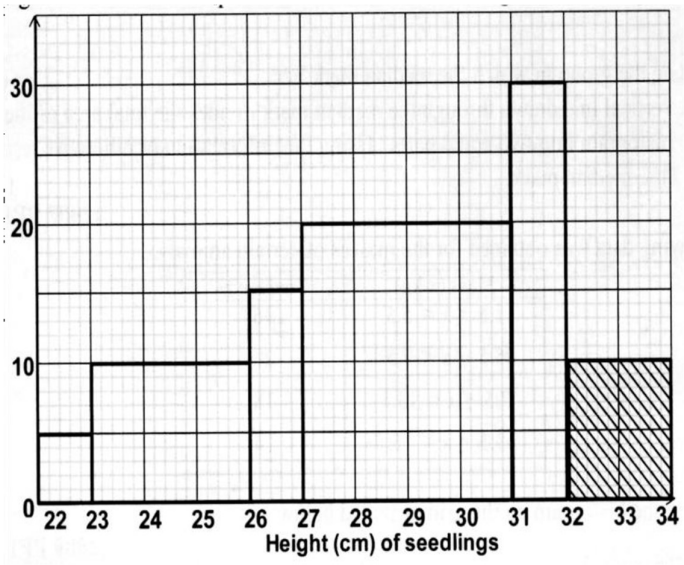
(a) (i) State the modal class **(1mk)**

(ii) Determine the class in which the median mark lies **(2mks)**

(b) Using an assumed mean of 54.4 calculate the mean mark. **(7mks)**

16.

The histogram below represents the distribution of heights a of seedlings of a certain plant.



The shaded area in the histogram represents 20 seedlings. Calculate the percentage number of seedlings with heights of at least 23 cm but less than 27 cm. **(3mks)**

17.

The frequency distribution table below represents the number of kilograms of meat sold in a butchery.

Mass in Kg	1 - 5	6 - 10	11 - 15	16 - 20	21 - 25	26 - 30	31 – 35
Frequency	2	3	6	8	3	2	1

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

(b) Calculate the mean mass. **(5mks)**

18.

The masses of people during a clinic session were recorded as shown in the table below.

Mass (kg)	40-44	45-49	50-54	55-59	60-64	65-69	70-74
No. of people	1	2	12	10	2	2	1

Calculate the mean mass. **(3mks)**

19.

The frequency table shows the daily wages paid to casual workers by a certain company.

Wages in Sh.	100-150	150-200	200-300	300-400	400-600
No. Of workers	160	120	380	240	100

(a) Draw a histogram to represent the above information. **(5mks)**

(b) (i) State the class in which the median wage lies **(1mk)**

(ii) Draw a vertical line, in the histogram showing where the median lies **(1mk)**

(c) Using the histogram, determine the number of workers who earn sh. 450 or less per day. **(3mks)**

20.

The table below shows the height, measured to the nearest cm, of 101 pawpaw trees.

Height in cm.	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59
Frequency	2	15	18	25	30	6	3	2

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

(b) Calculate to 2 decimal places:

(i) The mean height**;** **(4mks)**

(ii) The differences between the median height and the mean height **(5mks)**

21.

The masses in kilograms of 20 bags of maize were;

90,94,96,98,99,102,105,91,102,99,105,94,99,90,94,99,98,96,102 and 105

Using an assumed mean of 96kg, calculate the mean mass, per bag, of the maize **(3mks)**

22.

The production of milk, in litres, of 14 cows on a certain day was recorded as follows

22, 26, 15, 19, 20, 16, 27, 15, 19, 22, 21, 20, 22 and 28.

a) The mode; **(1mk)**

b) The median. **(2mks)**

23.

The lengths, in cm, of pencils used by pupils in a standard one class on a certain day were recorded as follows.

3	7	9	9	20	14	10	6	8	13
14	3	27	13	8	12	5	15	14	15
7	12	11	6	10	19	9	14	6	9
10	16	16	13	9	12	11	7	10	11

(a) Using a class width of 3, and starting with the shortest length of the pencils, make a frequency distribution table for the data.

(b) Calculate:

(i) The mean length of the pencils **(3mks)**

(ii) The percentage of pencils that were longer than 8cm but shorter than 15cm. **(2mks)**

(c) On the grid provided, draw a frequency polygon for the data **(3mks)**

24.

The table below shows the frequency distribution of marks scored by students in a test.

Marks	Frequency
1-10	2
11-20	4
21-30	11
31-40	5
41-50	3

Determine the median mark correct to 2 s.f. **(2mks)**

25.

The marks scored by a group of students in a test were recorded as shown in the table below

Marks	30-34	35-39	40-44	45-49	50-54	55-59	60-64
No. Of students	3	6	5	12	8	9	7

On the grid provided, and on the same axes, represent the above data using

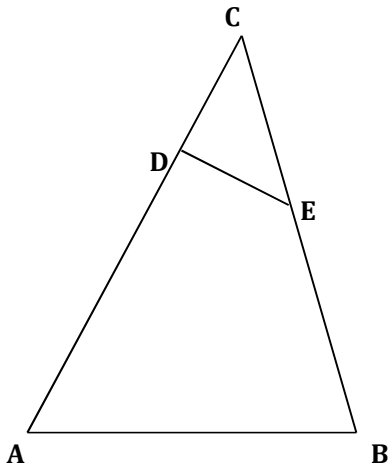
a) a histogram; **(3mks)**

b) a frequency polygon **(1mk)**

VECTORS (I)

1.

In the figure below, **AB** = **p**, **AC = q**, **AD** = $\frac{3}{5}$**AC** and **CE** = $\frac{2}{3}$**CB**



Express **DE** in terms of **p** and **q** **(3mks)**

2.

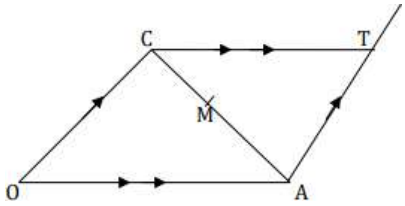
In a triangle ABC, D is the midpoint of AB and E is appoint on BC such that BE = $\frac{2}{3}$BC. If **AD** = **P** and **AC** = **Q**, express **EC** in terms of **p** and **q**. **(2mks)**

3.

A point T divides a line AB internally in the ratio 5: 2. Given that A is (-4, 10) And B is (10, 3) find the coordinates of T. **(4mks)**

4.

In the diagram below OABC is a parallelogram.



AB is produced to T such that BT **:** AB = 1**:**2. M is the midpoint of AC. Given that **OA = a** and **OC = c**. Express MT in term of a and c. **(3mks)**

5.

OABC is a trapezium such that the coordinates of O, A, B and C are (0,0),(2,-1), (4, 3) and (0, y).

a) Find the value of y **(2mks)**

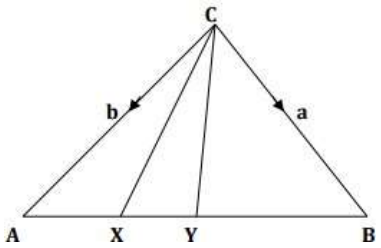
b) M is a midpoint of AB and N is a midpoint of OM. Show that A, N and C are collinear. **(6mks)**

6.

OABC is a trapezium in which **OA = a**, **OC = c** and **CB = 3a**. CB is produced to such that CB : BD = 3: 1. E is a point on AB such that **AB = 2AE**. Show that O, E and d are collinear**.** **(8mks)**

7.

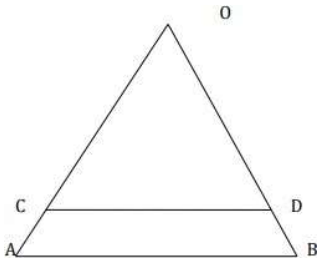
In the figure below **CA** = b **CB** = a, **AX** = **XY** and **AY** = **YB**.



Express CX in terms of a and b **(3mks)**

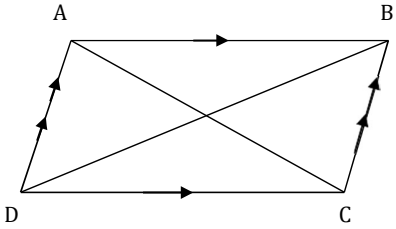
8.

In the figure below OC = 3 CA and OD = 3DB. By taking OA = a, OB = b, show that CD // AB. **(3mks)**

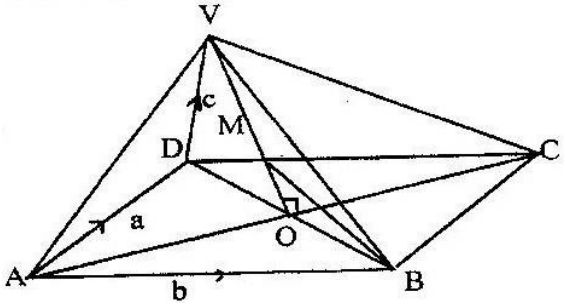


9.

In the figure below ABCD is a parallelogram. AOC and BOD are diagonals of the parallelogram. Show that the diagonals of the parallelogram bisect each other. Give reasons. **(3mks)**



The figure below is a right pyramid with a rectangular base ABCD and VO as the height. The vectors **AD**= a, **AB** = b and **DV** = c



a) Express

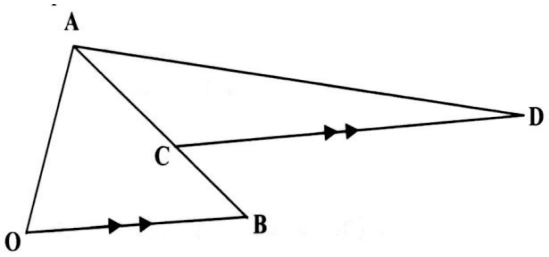
(i) AV in terms of **a** and **c** **(1mk)**

(ii) BV in terms of **a**, **b** and **c** **(2mks)**

(b) M is point on **OV** such that **OM: MV** = 3:4, Express **BM** in terms of **a, b** and **c** . Simplify your answer as far as possible **(5mks)**

10.

In the figure below, OA =3i + 4j and OB = 8i – j. C is a point on AB such that AC:CB = 3:2, and D is a point such that OB//CD and 2OB=CD



Determine the vector DA in terms of i and j. **(4mks)**

11.

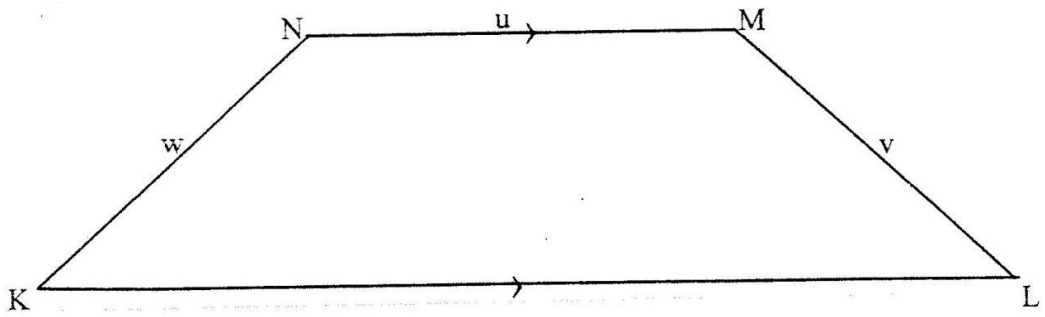
ABC is a triangle and P is on AB such that P divides AB internally in the ratio 4:3. Q is a point on AC such that PQ is parallel to BC. If AC = 14 cm

(i) State the ratio AQ:QC **(1mk)**

(ii) Calculate the length of QC **(1mk)**

12.

In the figure, KLMN is a trapezium in which KL is parallel to NM and **KL** = 3 **NM**



Given that **KN** = w, **NM** = u and **ML** = v. Show that 2 **u** = **v**+ **w** **(2mks)**

13.

In triangle OAB, $\overrightarrow{OA}$ = **a** $\overrightarrow{OB}$ = **b** and P lies on AB such that AP: BP = 3:5

(a) Find the terms of **a** and **b** the vectors

(i) $\overrightarrow{AB}$ **(1mk)**

(ii) $\overrightarrow{AP}$ **(1mk)**

(iii) $\overrightarrow{BP}$ **(1mk)**

(iv) $\overrightarrow{OP}$ **O** **(2mks)**

(b) Point Q is on OP such AQ = $-\frac{5}{8}a + \frac{9}{40}b$. Find the ratio OQ: QP **(3mks)**

14.

The coordinates of points O,P,Q and R are (0,0) , (3,4) , (11,6) and (8,2) respectively. A point T is such that vectors **OT, QP** and **QR** satisfy the vector equation. **OT** = **QP** + ½ **QR** .Find the coordinates of T. **(3mks)**

16.

a) If A, B and C are the points (2,-4),(4,0)and (1,6) respectively, use the vector method to find the co-ordinates of point D given that ABCD is a parallelogram.

b) The position vectors of points P and Q are p and q respectively is another point with position vector r = $\frac{3}{2}$**q** - $\frac{1}{2}$ **p**. Express in terms of **p** and **q**.

i) PR

ii) RQ hence show that P, Q and R are collinear.

iii) Determine the ratio PQ: QR.

17.

The points P, Q, R and S have position vectors 2**p**, 3**p**, **r** and 3**r** respectively, relative to an origin O. A point T divides PS internally in the ratio 1:6

(a) Find, in the simplest form, the vectors **OT** and **QT** in terms **P** and **r** **(4mks)**

(b) (i) Show that the points Q, T, and R lie on a straight line **(3mks)**

(ii) Determine the ratio in which T divides QR **(1mk)**

18.

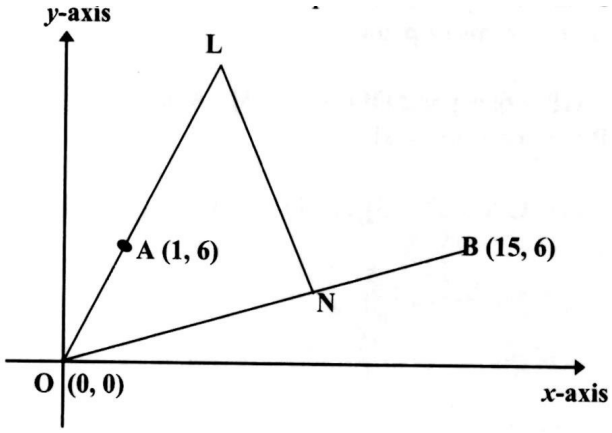
Two points P and Q have coordinates (-2, 3) and (1, 3) respectively. A translation map point P to P' (10, 10)

a) Find the coordinates of Q' the image of Q under the translation **(1mk)**

b) The position vector of **P** and **Q** in (a) above are p and q respectively given that *m***p** – *n***q** = $\begin{pmatrix} -12 \\ 9 \end{pmatrix}$. Find the value of *m* and *n* **(3mks)**

19.

In the diagram below, the coordinates of points A and B are (1,6) and (15,6) respectively). Point N is on OB such that 3 ON = 2OB. Line OA is produced to L such that OL = 3 OA



(a) Find vector LN **(3mks)**

(b) Given that a point M is on LN such that LM: MN = 3: 4, find the coordinates of M **(2mks)**

(c) If line OM is produced to T such that OM: MT = 6:1

(i) Find the position vector of T **(4mks)**

(ii) Show that points L, T and B are collinear **(4mks)**

20.

The position vectors of point A and B with respect to the O, are $\begin{pmatrix}-8\\5\end{pmatrix}$ and $\begin{pmatrix}12\\-5\end{pmatrix}$ respectively. Point M is the midpoint of AB and N is the midpoint of OA.

(a) Find:

i) The coordinates of N and M **(3mks)**

ii) The magnitude of NM **(3mks)**

(b) Express vector **NM** in term of **OB**. **(1mks)**

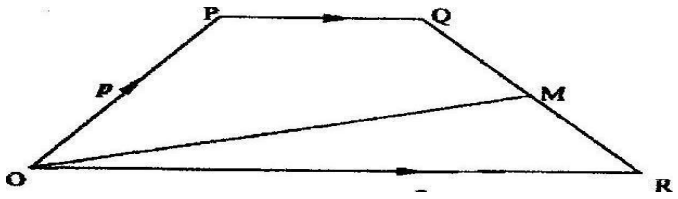
(c) Point P maps onto P by a translation $\begin{pmatrix}-5\\8\end{pmatrix}$ .Given that **OP**=**OM**+2**MN**, find the coordinates of P' **(3mks)**

21.

Vector **OA** = $\begin{pmatrix}2\\1\end{pmatrix}$ and **OB**=$\begin{pmatrix}6\\-3\end{pmatrix}$. Point C is on OB such CB=2OC and point D is on AB such that AD=3DB.Express **CD** as a column vector. **(3mks)**

22.

In the figure below, OPQR is a trapezium in which PQ is parallel to OR and M is the mid-point of QR and **OP=p, OR=r** and **PQ** = $^1/_3$ **OR**.



Find **OM** in terms of **p** and **r.** **(3mks)**

23.

Vector **OP**=6**i** + **j** and **OQ**+ -2**i** +5**j**. A point N divides **PQ** internally in the ratio 3:1. Find **PN** in terms of i and j. **(3mks)**

24.

Given that **OA** = 2**i** + 3**j** and 3**i** – 2**j**

Find the magnitude of **AB** to one decimal place **(3mks)**

25.

Given that **P** = 5**a** – 2 **b** where **a** = $\begin{pmatrix}3\\2\end{pmatrix}$ and **b** = $\begin{pmatrix}4\\1\end{pmatrix}$ find

a) Column vector **p** **(2mks)**

b) P', the image **P** under translation vector $\begin{pmatrix}-6\\4\end{pmatrix}$ **(1mk)**