Candidate Name	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4004/1

PAPER 1

NOVEMBER 2018 SESSION **2 hours 30 minutes**

Additional materials:
Candidates answer on the question paper
Geometrical Instruments

Allow candidates 5 minutes to count pages before the examination.
This booklet should not be punched or stapled and pages should not be removed.

INSTRUCTIONS TO CANDIDATES

Write your Name, Centre number and candidate number in the spaces at the top of this page.

Write your centre and candidate number in the box on the top right corner of every page of this paper.

Check that all the pages are in the booklet and ask the invigilator for a replacement if there are duplicate or missing pages.

Answer **all** questions.

Write your answers in the spaces provided on the question paper using **black** or **blue** pens.

If working is needed for any question, it must be shown in the space below that question. Omission of essential working will result in loss of marks.

Decimal answers which are not exact should be given correct to three significant figures unless stated otherwise.

Mathematical tables, slide rules and calculators should not be bought into the examination room

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question

This question paper consists of 20 printed pages and 0 blank page(s).

Candidate Name	Centre Number	Candidate Number

Answer all questions.

NEITHER MATHEMATICAL TABLES NOR SLIDE RULES NOR CALCULATORS MAY BE USED IN THIS PAPER.

1. a) Simplify $\frac{2^3}{3^2}$ giving the answer as a fraction.

Answer (a) ..... **[1]**

b) Express

i) $\frac{6}{25}$ as a decimal fraction,

(b)(i) ..... **[1]**

ii) 0,125 in standard form.

(b)(ii) ..... **[1]**

2. The following is a list of real numbers:

$\frac{3}{7}$; 11; $\sqrt{\frac{3}{2}}$; 121; –19; π; $\sqrt{64}$.

Choose from the list

a) a square number,

Answer (a) ..... **[1]**

b) irrational numbers.

(b) ..... **[2]**

3. a) Express $4 \times 5^3 + 3 \times 5^2 + 2$ as a number in base 5.

Answer: (a) ..... **[1]**

b) Evaluate

i) $10111_2 + 1010_2$ giving the answer in base 2.

(b)(i) ..... [1]

ii) $512^7 - 435^7$ giving the answer in base 7.

(b)(ii) ..... [1]

4. a) Express 00 45 in 12 hour notation.

Answer (a) ..... [1]

b) Gortha's local time is 3 hours 45 minutes ahead of Harare's local time.

Find the time in Harare when the time in Gortha is 21 23.

(b) ..... [1]

c) Convert 5 km^2 to hectares.

(c) ..... [1]

5. a) Express $6,07 \times 10^4$ in ordinary form.

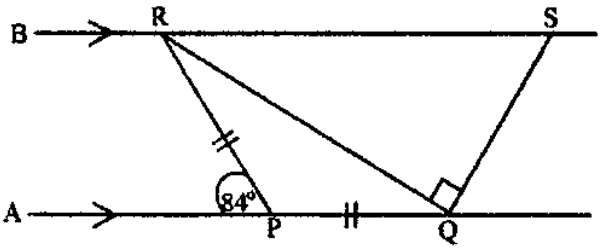
Answer (a) ..... [1]

b) Evaluate $2,53 \times 10^1 + 6,1 \times 10^{-1}$, giving the answer in standard form.

(b) ..... [2]

Candidate Name	Centre Number	Candidate Number

6.



In the diagram AQ and BS are parallel lines such that

PQ = PR, $A\hat{P}R = 84°$ and $R\hat{Q}S = 90°$.

Find

a) $P\hat{R}Q$,

Answer (a) ..... **[1]**

b) $Q\hat{R}B$,

(b) ..... **[1]**

c) $Q\hat{S}R$.

(c) ..... **[1]**

7. Solve the simultaneous equations:

$2x + 3y = 11$

$3x - 5y = -12$

Answer .....

..... [3]

8. The wave length, w, is inversely proportional to its frequency, f.

When $f = 90$, $w = 675$.

Find

a) an equation connecting f and w,

Answer (a) ..... **[2]**

b) the value of f when $w = 500$.

(b) ..... **[1]**

9. a) Write 45,3981 correct to 4 significant figures.

Answer (a) ..... **[1]**

b) A student spends 8 seconds, correct to the nearest second, to solve a problem.

Find the limits between which this time lies in the form $a \leq t < b$ where a and b are constants and t is the time.

(b) ..... **[2]**

10. a) Factorise $3x^2 - 15x$ completely.

Answer (a) ..... **[1]**

b) Find the Highest Common Factor (H.C.F.) of

$8kl^2m$, $28k^2l^3m$ *and* $36l^2mn$.

(b) ..... **[2]**

11. The points A(6; 2) and B(8; 5) lie on a straight line.

Find the

a) gradient of the line AB,

Answer (a) ..... **[1]**

b) equation of the line AB, giving the answer in the form $y = mx + c$.

(b) ..... **[2]**

12. Simplify $\frac{2a+6}{a-3} \div \frac{a+3}{a^2-2a-3}$.

Answer ..... **[3]**

13. a) Express the ratio 3,5 kg : 800 g in its simplest form.

Answer (a) ..... **[1]**

b) In 2016 a farmer harvested 4,5 tonnes of maize. This was 20% more than what he had harvested in 2015.

Find the number of tonnes of maize the farmer harvested in 2015.

(b) ..... tonnes **[2]**

14. a) Solve the inequality

$4 - 5x < 2x + 8$.

Answer (a) ..... **[2]**

b) Write down the smallest integer that satisfies the inequality

$4 - 5x < 2x + 8$.

(b) ..... **[1]**

15. If $\log a = 3$ and $\log b = 7$,

calculate

a) $\log ab$,

Answer (a) ..... **[1]**

b) $\log \frac{1}{b}$,

(b) ..... **[1]**

c) $\log \sqrt[3]{a}$.

(c) ..... **[2]**

16. a) If a function $f(x) = (x + 4)(2x - 1)$,

find $f(3)$.

Answer (a) ..... **[2]**

b) Solve the equation

$$\frac{3m}{4} - \frac{m}{3} = 2\frac{1}{2}.$$

(b) ..... **[2]**

17. It is given that vector $p = \begin{pmatrix} 0 \\ -3 \end{pmatrix}$ and vector $q = \begin{pmatrix} x \\ 1 \end{pmatrix}$.

Find

a) $p - q$ in terms of x in its simplest form,

Answer (a) ..... **[1]**

b) the possible values of x given that $|p - q| = 5$.

(b) ..... **[3]**

18. a) State the special name given to a **regular** polygon with 4 sides.

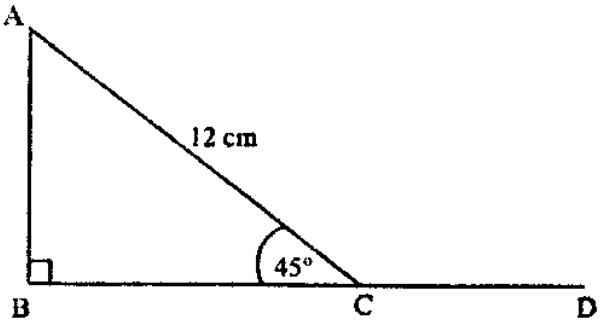
Answer (a) ..... **[1]**

b) The angles of a hexagon are 115°, 89°, $x°$, $x°$, $x°$ and $x°$.

Find the value of x.

(b) ..... **[3]**

19.



In the diagram, triangle **ABC** is right angled at **B**, **BCD** is a straight line, **AC** = 12 cm and $B\hat{C}A = 45°$.

$[Sin\ 45° = \frac{\sqrt{2}}{2},\ Cos\ 45° = \frac{\sqrt{2}}{2}]$

Using as much of the information given **above** as is necessary,

calculate

a) BC, leaving the answer in surd form,

Answer (a) ..... **[2]**

b) Sin $A\hat{C}D$ leaving the answer in surd form,

(b) ..... **[1]**

c) tan $A\hat{C}D$.

(c) ..... **[2]**

20. The table below shows the heights, h, of 50 trees in a school orchard.

Height (h) m	$2 < h \leq 6$	$6 < h \leq 8$	$8 < h \leq 10$	$10 < h \leq 12$
Frequency	*12*	*16*	*12*	*10*

a) Write down the interval which contains

i) the modal height,

Answer (a)(i) ..... **[1]**

ii) the median height.

(a)(ii) ..... **[1]**

b) Calculate an estimate of the mean height of the trees.

(b) ..... **[3]**

21. The probability that Themba will score in a match is $\frac{1}{3}$. The probability that Allan will score in the same match is $\frac{3}{4}$.

Calculate the probability that in the same match

a) both score,

Answer (a) ..... **[2]**

b) neither of them scores,

(b) ..... **[2]**

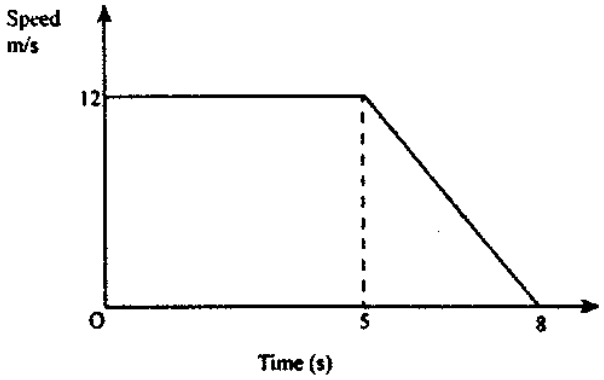
c) only one of them scores.

(c) ..... **[2]**

22. a) Convert a speed of 12 m/s to a speed in km/h.

Answer (a) ..... **[2]**

b)



The graph shows the motion of an athlete running on level ground at a constant speed of 12 m/s for 5 seconds. The athlete then retards uniformly to rest after a further 3 seconds.

Calculate the

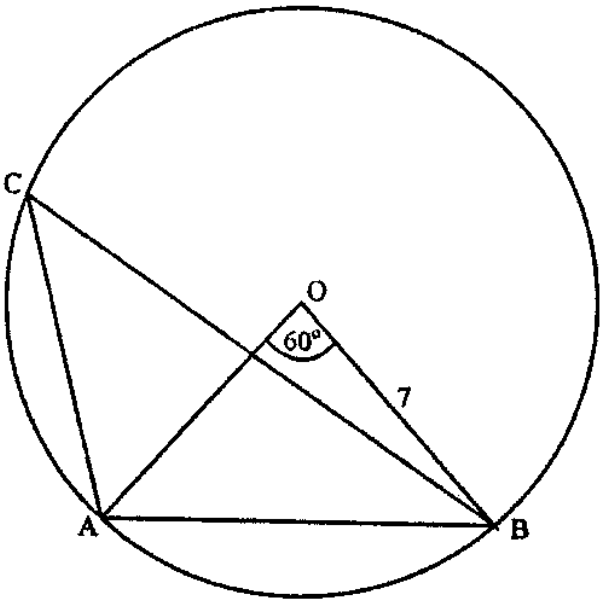
i) total distance covered in the 8 seconds,

(b)(i) ..... **[2]**

ii) acceleration of the athlete in the last 3 seconds.

(b)(ii) ..... **[2]**

23.



In the diagram points **A, B** and **C** are on the circumference of circle centre **O, OB** = 7cm and $A\hat{O}B = 60°$.

In this question take π to be $\frac{22}{7}$.

Calculate

a) $A\hat{C}B$,

Answer (a) ..... **[1]**

b) $O\hat{A}B$,

(b) ..... **[1]**

c) the length of minor arc **AB**,

(c) ..... **[2]**

d) the area of the minor sector **AOB**.

(d) ..... **[2]**

24. It is given that the universal set , ξ, has subsets **P, S** and **M** such that,

$\xi = \{1;2;3;4;5;6;7;8;9\}$,

P = {prime numbers},

S = {perfect square numbers},

M = {multiples of 3}.

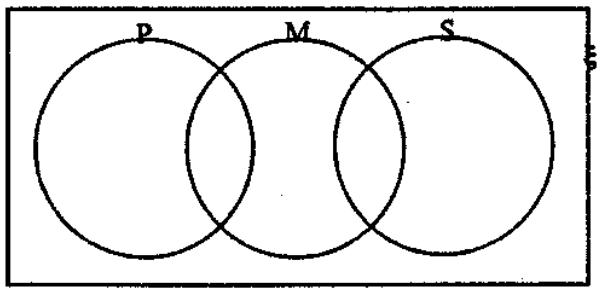
a) List all elements of set **P**.

Answer (a) ..... **[2]**

b) Write down $n(P \cap S \cap M)$.

(b) ..... **[1]**

c) Complete the Venn Diagram by inserting elements in the correct regions



(c) ..... on the diagram **[3]**

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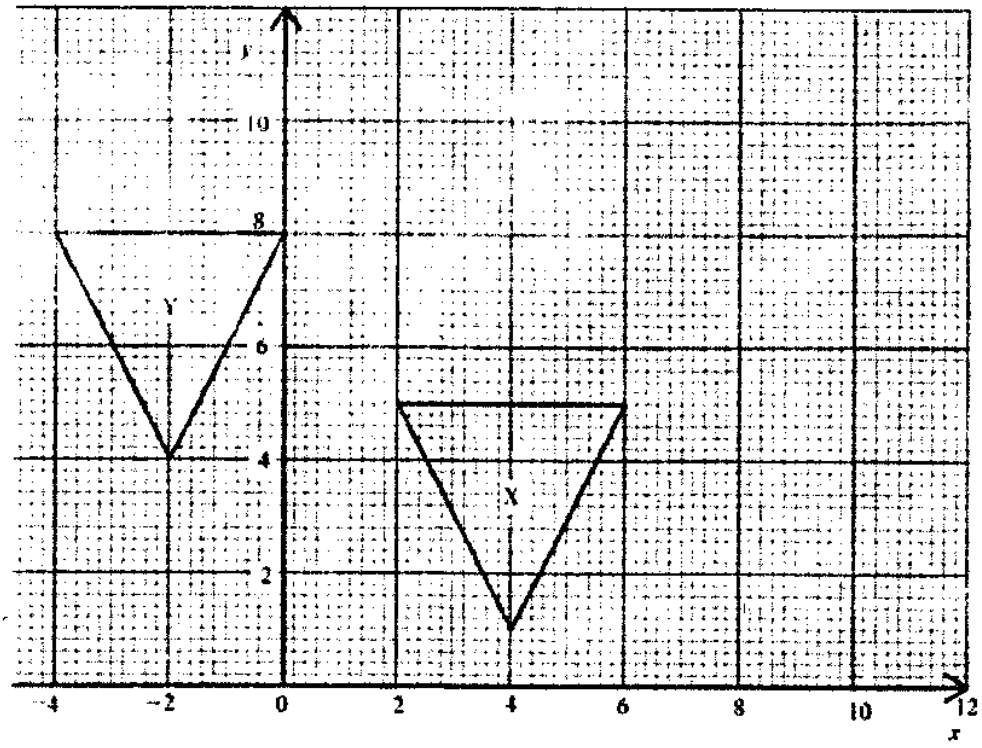
25.



The graph shows triangles X and Y.

a) Triangle Y is an image of triangle X under a certain single transformation.

Describe fully the single transformation which maps triangle X onto triangle Y.

Answer (a) .....

..... **[3]**

b) Triangle Z is the image of triangle X under an Enlargement of scale factor 2 and centre (0; 0).

i) State the matrix that represents the enlargement.

(b)(i) ..... **[2]**

ii) Draw and label triangle Z.

(b)(ii) ..... on the grid **[3]**

Total marks: 100

Candidate Name	Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4004/2

PAPER 2

NOVEMBER 2018 SESSION **2 hours 30 minutes**

Additional materials:
Mathematical tables
Electronic Calculator

Allow candidates 5 minutes to count pages before the examination.
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INSTRUCTIONS TO CANDIDATES

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Write your centre and candidate number in the box on the top right corner of every page of this paper.

Check that all the pages are in the booklet and ask the invigilator for a replacement if there are duplicate or missing pages.

Answer **all** questions in Section A and **any four** from Section B.

Write your answers in the spaces provided on the question paper using **black** or **blue** pens.

If working is needed for any question, it must be shown in the space below that question. Omission of essential working will result in loss of marks.

Decimal answers which are not exact should be given correct to three significant figures unless stated otherwise.

Answers in degrees should be given correct to one decimal place.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question

Mathematical tables and calculators may be used to evaluate explicit numerical expressions.

This question paper consists of 20 printed pages and 0 blank page(s).

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SECTION A (52 Marks)

Answer **all** questions in this section.

1. Simplify

a) i) $ax - x(a - b) + 2bx$,

Answer (a)(i) ..... **[2]**

ii) $(x - 2)^2 - x^2$.

(a)(ii) ..... **[2]**

b) Given that $P = \frac{1}{2}[a + d(a + d)]$,

evaluate P when $a = \frac{1}{2}$ and $d = 1$.

(b) ..... **[2]**

c) Express $\frac{x - 3}{x - 2} - \frac{x + 2}{x + 3}$ as a single fraction in its lowest terms.

(c) ..... **[3]**

2. a) The following is a price list from *Bright Link Chemical Company.*

Bright Link (Pvt) Ltd.
Price List

Item	Quantity	Price
Floor polish	20*l*	$50
Toilet Dip	20*l*	$30
Sanitiser	20*l*	$28
Channel blocks	5*kg*	$50
Dish washer	20*l*	$28

All prices include 15% Value Added Tax (VAT).
N.B. PROMOTION PROMOTION PROMOTION
Place an order between 1 January and 28 February this year and get 10% **discount**

Calculate

i) the price of channel blocks per kilogram (kg),

Answer (a)(i) ..... **[2]**

ii) Value Added Tax on a twenty-litre bucket of floor polish.

(a)(ii) ..... **[2]**

iii) A School ordered the following on the fourth of January of the same promotional year:
Two 20 litre buckets of floor polish
One 20 litre container of toilet dip
Two 20 litre containers of dish washer
One 20 litre container of sanitiser
Three 5 kg boxes of channel blocks

Calculate the total discount the school got.

(b) ..... [3]

b) A man invested $400 in a bank that offers 3% p.a **compound interest.**
Calculate the total amount he would get at the end of 3 years.

(c) ..... [3]

3. a) i) Solve the inequality $4x - 2 \leq 5x + 2 < 2x + 8$,
giving your answer in the form $a \leq x < b$, where a and b are integers.

Answer (a)(i) ..... **[3]**

ii) Illustrate the answer on a number line.

(a)(ii) ..... **[1]**

b) Make x the subject of the formula

$$R = \sqrt{\frac{ax - p}{Q + bx}}$$

(b) ..... **[4]**

c) Factorise completely $2m^3n^2 + 3m^2n - 2m$.

(c) ..... **[2]**

Candidate Name	Centre Number	Candidate Number

4. Answer the whole of this question below

Use ruler and compasses only for all constructions and show clearly all construction lines and arcs. All constructions should be done on a single diagram.

a) Construct triangle ABC with $A\hat{B}C = 45°$, BC = 6, 5 cm and AB = 6 cm.

Answer (a) on diagram ..... **[4]**

b) Construct the locus of points 4 cm from A.

(b) on diagram ..... **[1]**

c) Bisect $B\hat{C}A$

(c) on diagram ..... **[2]**

d) Mark and label X_1 and X_2, the points that are on the bisector of $B\hat{C}A$ and are 4 cm from A.

(d) on diagram ..... [2]

e) Describe the locus represented by the bisector of $B\hat{C}A$.

(f) .....

.....

..... [1]

5. a) It is given that the universal set $\xi = \{x : 1 \leq x \leq 10,\ x \text{ is an integer.}\}$, has subsets **A** and **B** such that
A = {perfect square numbers} and
B = {multiples of 4}

i) List all elements of set **A**,

Answer (a)(i) ..... [2]

ii) List all elements of set $A \cap B$,

(a)(ii) ..... [1]

iii) Find $n(A \cup B)$

(a)(iii) ..... [1]

b) It is given that $P \subset Q$ and $Q \subset R$

i) Draw a Venn diagram to show the three sets P, Q and R

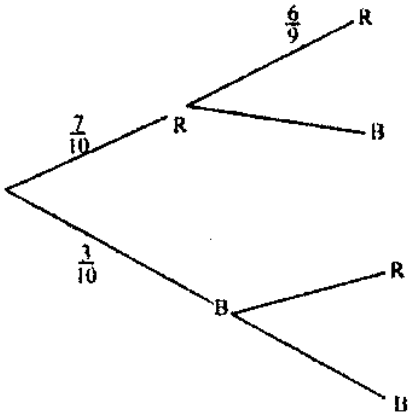
(b)(i) ..... [2]

ii) Write in set notation the relationship between set **P** and set **R**.

(b)(ii) ..... [1]

c) A bag contains 10 buttons that are identical except for colour. 7 of the buttons are red and 3 are blue. Two buttons are drawn at random, one after the other without replacement.

i) Complete the tree diagram.



(c)(i) ..... [2]

ii) Find the probability that both buttons are red.

(c)(ii) ..... [2]

iii) Find the probability that at least one of the buttons is red.

(c)(iii) ..... [2]

SECTION B (48 Marks)
Answer **any four** questions from this section.
Each question carries 12 marks.

6. At a soccer match, a boy conducted a survey of the age of vehicles that were parked at the stadium. The information is displayed in the following table.

Age (x years)	$0 < x \leq 5$	$5 < x \leq 10$	$10 < x \leq 15$	$15 < x \leq 20$	$20 < x \leq 25$
Number of vehicles	10	12	37	51	10

Calculate an estimate of the mean age of the vehicles.

Answer (a) ..... **[3]**

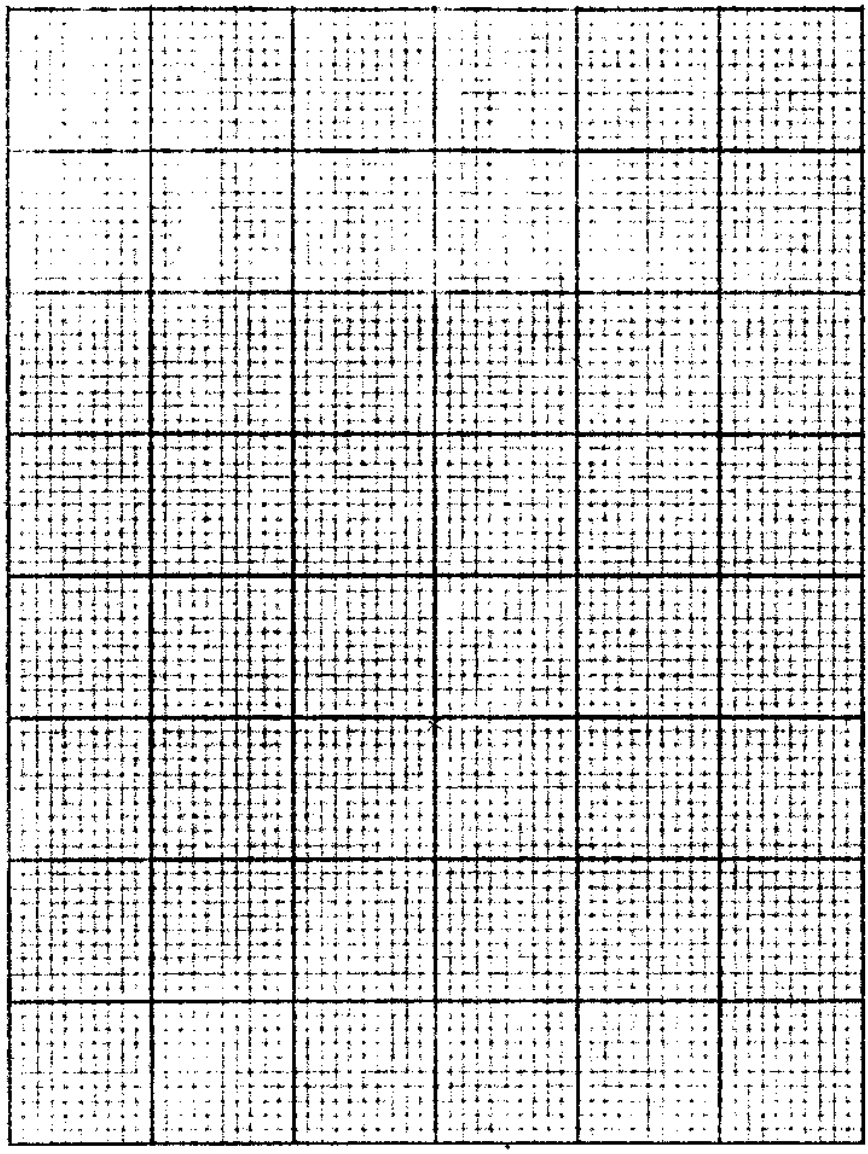
b) The same information of the survey is displayed in the following cumulative frequency table.

Age (x years)	$x < 5$	$x < 10$	$x < 15$	$x < 20$	$x < 25$
Cumulative frequency	10	22	n	110	120

i) Find the value of n.

(b)(i) ..... **[1]**

ii) Draw a cumulative frequency curve on the grid using a scale of 2 cm to 5 years on the age axis and 2 cm to 20 on the cumulative frequency axis.



[4]

c) Use the graph to find the

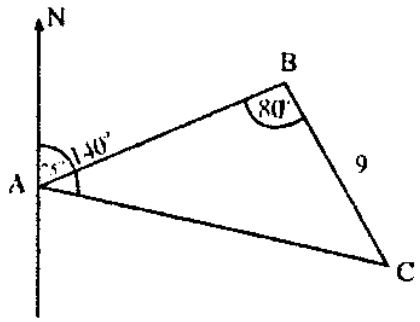
i) median age,

(c)(i) ..... **[2]**

ii) upper quartile.

(c)(ii) ..... **[2]**

7.



In the diagram, A, B and C are 3 points on level ground such that the bearing of B from A is 075° and that of C from A is 140°. B is 9 km from C and $A\hat{B}C = 80°$.

a) i) Calculate $B\hat{A}C$

Answer (a)(i) ..... **[1]**

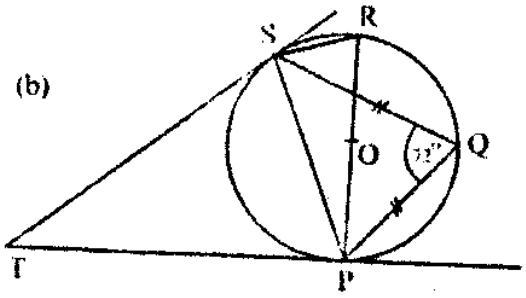
ii) Calculate the distance from A to C

(a)(ii) ..... **[2]**

iii) Calculate the shortest distance from B to AC

(a)(iii) ..... **[2]**

b)



In the diagram P, Q, R and S are points on the circumference of a circle centre O. POR is the diameter of the circle, PT and ST are tangents to the circle, $S\hat{Q}P = 72°$ and chords PQ and QS are equal.

Calculate

i) $P\hat{S}Q$,

(b)(i) ..... **[2]**

ii) $S\hat{R}P$,

(b)(ii) ..... **[1]**

iii) $S\hat{P}R$,

(b)(iii) ..... **[2]**

iv) $P\hat{T}S$.

(b)(iv) ..... **[2]**

8. It is given that y varies inversely as the square root of x and that when $y = 2$, $x = 9$.
Find,

a) i) the equation connecting y and x,

Answer (a)(i) ..... **[2]**

ii) x when $y = \frac{1}{2}$.

(a)(ii) ..... **[2]**

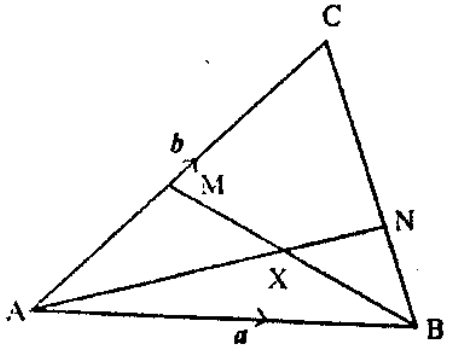
b) i) Show that $\log (3x + 1) + \log (x - 3) = 1$ reduces to $3x^2 - 8x - 13 = 0$.

(b)(i) ..... **[3]**

ii) Hence solve the equation $3x^2 - 8x - 13 = 0$, giving your answers correct to one decimal place.

(b)(ii) ..... **[5]**

9.



In the diagram M is the midpoint of AC. N lies on BC such that BN = $\frac{1}{3}$ BC,

$\vec{AB} = a$ *and* $\vec{AC} = b$

Express in terms of a and/or b

i) $\vec{BC}$

Answer (a)(i) ..... **[1]**

ii) $\vec{BN}$

(a)(ii) ..... **[1]**

iii) $\vec{AN}$

(a)(iii) ..... **[2]**

iv) $\vec{BM}$

(a)(iv) ..... **[1]**

b) Given that $B\vec{X} = hB\vec{M}$, express $A\vec{X}$ in terms of a, b *and* h.

(b) ..... **[2]**

c) Given also, that
$A\vec{X} = kA\vec{N}$, express $A\vec{X}$ in terms of a, b *and* k.

(c) ..... **[1]**

d) Using the results (b) and (c), find the value of h and the value of k.

(d) ..... **[4]**

10. The following is a table of values for the function $y = 2x + 3 - x^2$

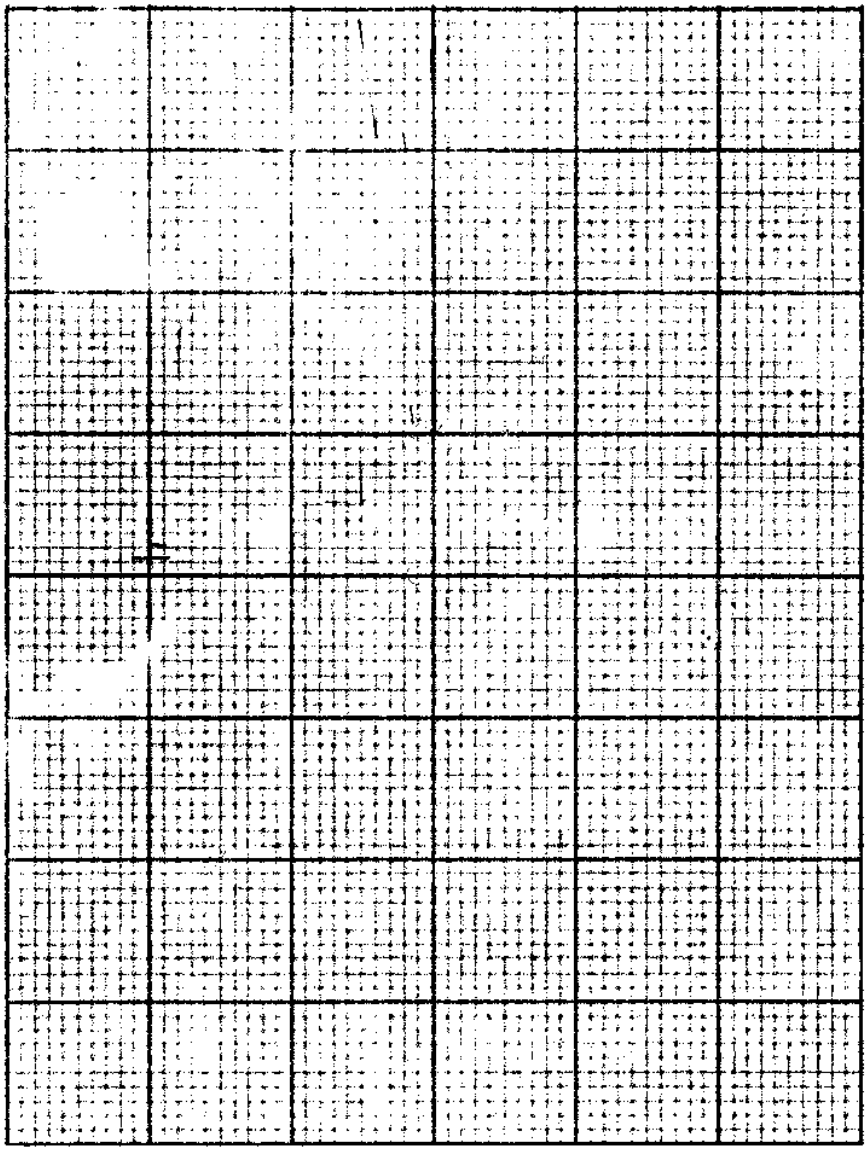
x	-2	-1	0	1	2	3	4
y	-5	p	3	q	3	0	-5

Find the value of p and the value of q.

(a) .....

..... **[2]**

b) Answer this part of the question on the grid below.
Use a scale of 2cm to 1 unit on both axes for $-3 \leq x \leq 5$ and $-6 \leq y \leq 7$.



i) Draw the graph of $y = 2x + 3 - x^2$. **[4]**

ii) On the same axes, draw the graph of the line $y = -x$. **[1]**

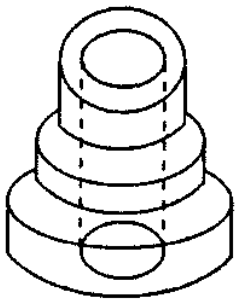
c) Use the graph to find an estimate of the

i) solution to the equation $-x^2 + 2x + 3 = -x$, **[2]**

ii) area bounded by the curve, the lines, $x = 0$, $x = 1$ *and* $y = -x$.

..... (unit)² **[3]**

11. a)



The diagram shows a solid aluminium alloy casting for a pulley which consists of 3 discs each $1\frac{1}{2}$ cm thick, of diameters 4 cm, 6 cm and 8 cm, with a central hole 2 cm in diameter.
Calculate the

i) volume of aluminium used to make the casting,

Answer (a)(i) ..... **[4]**

ii) mass, in grammes, of the casting if the density of the alloy is 2,8 g / cm^3,

(a)(ii) ..... **[2]**

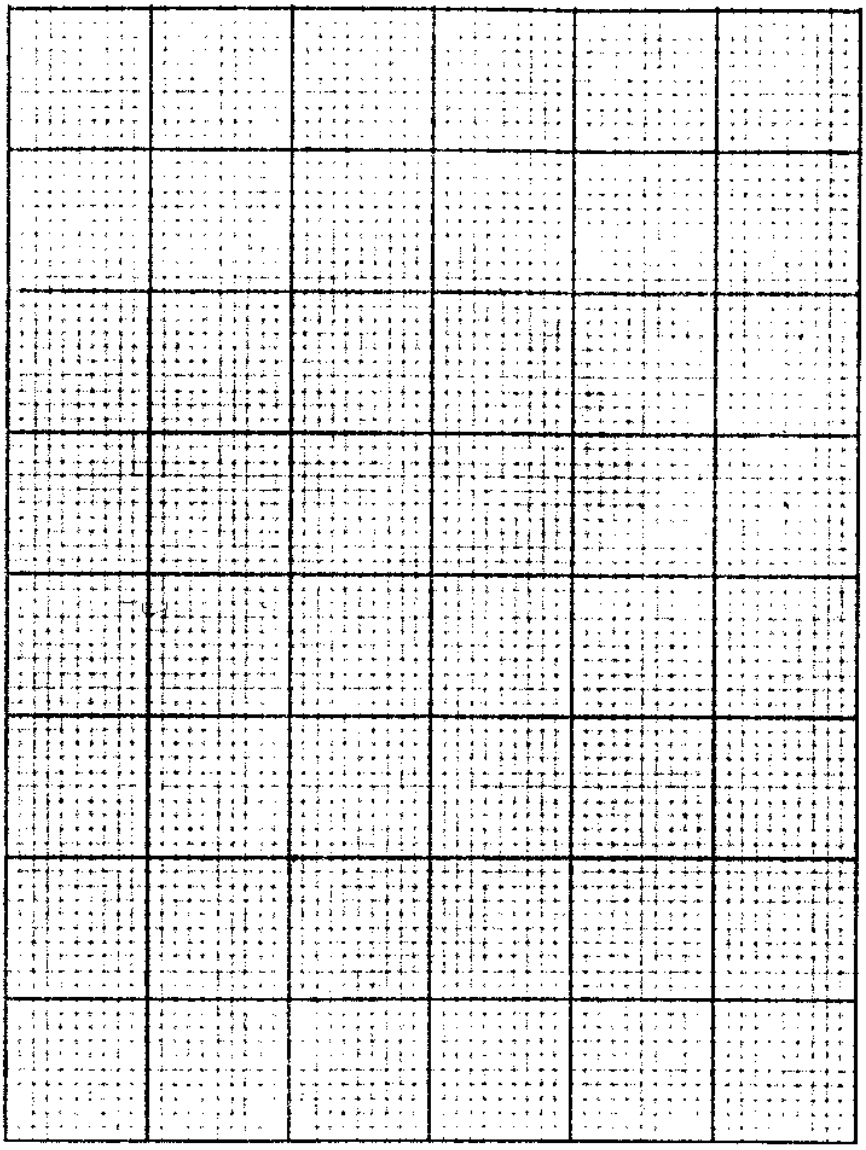
iii) total price of the casting if the alloy costs $7,50 per gramme.

(a)(iii) ..... **[2]**

b) A triangular plot has two of its boundaries measuring 400 m and 440 m with an included angle of 46°.
Calculate the area of the plot, giving the answer in hectares.

(b) ..... **[4]**

12. Answer the whole of this question on the grid below using a scale for $-4 \leq x \leq 6$ and $-8 \leq y \leq 4$ of 2cm to 2 units on both axes.



Triangle P has vertices at (1; 2), (1; 4) and (2; 4)
Draw and label triangle P.

Answer (a) on graph ..... **[1]**

b) Triangle P is mapped onto triangle Q by an enlargement of factor -2 centre the origin.
Draw and label triangle Q.

(b) on graph ..... **[2]**

c) Triangle P is mapped onto triangle R by a translation through $\begin{pmatrix} -3 \\ -5 \end{pmatrix}$.
Draw and label triangle R.

(c) on graph ..... **[2]**

d) Draw triangle N the image of a triangle P under a transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$.

(d) on graph ..... **[3]**

e) Triangle S has vertices (2;2), (2;4) and (4;4).

i) Draw and label triangle S.

(e)(i) on graph ..... **[1]**

ii) Describe fully the single transformation which maps triangle P onto triangle S.

(e)(ii) .....

.....

..... **[3]**