For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Ordinary Level

MATHEMATICS   **4030/1**

PAPER 1

JUNE 2018 SESSION   2 hours 30 minutes

Candidates answer on the question paper.
Additional materials:
Geometrical instruments

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

TIME   2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES
Write your Name, Centre number and Candidate number in the spaces at the top of this page and your Centre number and Candidate number on the top right corner of every page of this paper.

Answer *all* questions.
Check that all the pages are in the booklet and ask the invigilator for a replacement if there are duplicate or missing pages.
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 unless stated otherwise.

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

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

[Turn over

2

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

1 **(a)** Express 3598

   (i) as a number in standard form,

   (ii) correct to 2 significant figures.

(b) Find the approximate value of $\sqrt{3598}$.

Answer: *(a)*   *(i)* _____ [1]

   (ii) _____ [1]

(b) _____ [1]

2   **(a)**   Find the exact value of

           (i) $7,03 - 2,145$,

           (ii) $4,32 \times 0,11$.

      (b)   Simplify $1\frac{7}{8} + 2\frac{1}{3}$, giving the answer as a mixed number.

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

                       (ii)   _____   [1]

          (b)   _____   [1]

[Turn over

4

3 **(a)** Express the time 00 25 in 12 hour notation.

(b) A goods train left Johannesburg at 20 30 on a Wednesday and arrived in Beitbridge after travelling for 27 hours 45 minutes.

  (i) State the day on which the train arrived at Beitbridge.

  (ii) Find the time at which the train arrived at Beitbridge.

Answer   *(a)* _____ [1]

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

         (ii) _____ [1]

4 Evaluate

    (a) $\sqrt[3]{0,027}$,

    (b) $\left(1\frac{7}{9}\right)^{\frac{1}{2}}$,

    (c) $3^0 \times 3^{-2}$.

Answer   *(a)*   ——————————————   [1]

            (b)   ——————————————   [1]

            (c)   ——————————————   [1]

6

5   (a)   State the number of lines of symmetry of a regular nonagon.

(b)   The sum of interior angles of a regular polygon is $3\,960^0$.

Find the number of sides of the regular polygon.

Answer   *(a)*   _____ [1]

(b)   _____ [2]

6   **(a)**   Simplify $1044_8 - 175_8$, giving the answer in base 8.

      (b)   Convert 10111_2 to a number in base 6.
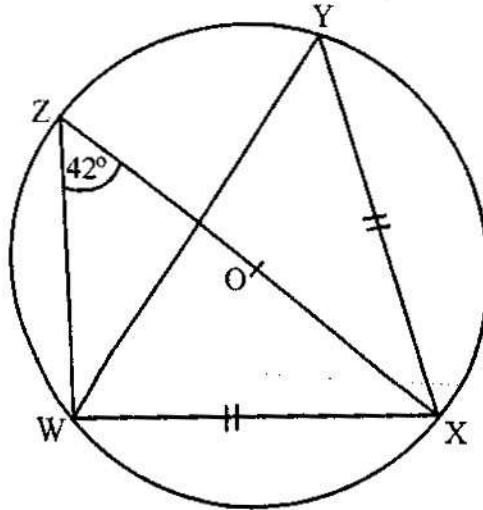
Answer   *(a)*   _____   [1]

                  (b)   _____   [2]

8

7

In the diagram W, X, Y and Z are points on the circumference of a circle centre O, WX = XY and $X\hat{Z}W = 42°$.

Calculate

(a) $W\hat{Y}X$,

(b) $Y\hat{W}Z$,

(c) $W\hat{X}Y$.

Answer   *(a)* _____ [1]

(b) _____ [1]

(c) _____ [1]

8   Solve the equations:

(a) $\frac{1}{3}x - 1 = 7$

(b) $4^{2n-3} = 8$

Answer   *(a)* $x =$ _____ [1]

(b) $n =$ _____ [2]

10

9   **(a)**   Three sets A, B and C are such that A ⊏ B and C ⊏ A. In the answer space, draw the Venn diagram to show the relationship between sets A, B and C.

      (b)
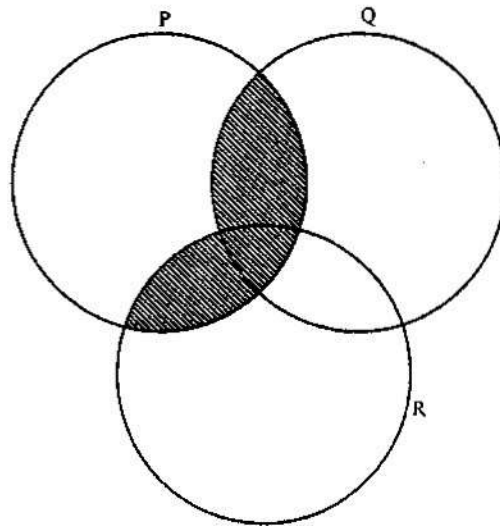
In the diagram, three sets P, Q and R are intersecting. Use set notation to describe the shaded region.

Answer   *(a)*   [2]

          (b)   _____   [1]

11

10   It is given that y varies directly as the square of $(x - 3)$.

   (a)   Express y in terms of x and a constant k.

   (b)   Given that $y = 16$ when $x = 1$, find y when $x = 10$.

Answer *(a)* _____ [1]

           (b) _____ [2]

12

11   Solve the simultaneous equations:

$$x + y = 5\frac{1}{2}$$

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

Answer x = _____

y = _____   [3]

12   It is given that $3x + 2y = 12$ is an equation of a straight line.

    (a)   Find the gradient of the straight line.

    (b)   Find the coordinates of the point where the straight line crosses the *y*-axis.

Answer   *(a)*   _____ [1]

               (b)   _____(____ ; ____)_____[2]

14

13   Simplify

$$\frac{3x^2}{x^2 - 5x} \div \frac{x}{x^2 - 25}.$$

Answer _____ [3]

14   The formula for converting a temperature in degrees centigrade (°C) to a temperature in degrees Fahrenheit (°F) is $F = 32 + \frac{9C}{5}$.

(a)   Find F when C = 30°.

(b)   Make C the subject of the formula.

Answer   *(a)*   F = _____ [1]

          (b)   C = _____ [2]

16

15 **(a)** Expand and simplify,

$$-3(x - 7) + 5(2 - 4x).$$

(b) The length of a side of a regular hexagon is 3,4 cm correct to one decimal place.

Find the least possible perimeter of the regular hexagon.

Answer *(a)* _____ [2]

(b) _____ [2]

17

16   (a)   Factorise completely

    (i) $x^3 - x$,

    (ii) $x^2 + 2x + 1$.

    (b)   Hence or otherwise find the Highest Common Factor (HCF) of $x^3 - x$ and $x^2 + 2x + 1$.

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

            (ii)   _____   [1]

        (b)   _____   [1]

18

17   It is given that vector $\mathbf{p} = \begin{pmatrix} 3 \\ -4 \end{pmatrix}$ and vector $\mathbf{q} = \begin{pmatrix} -2 \\ x \end{pmatrix}$.

(a)   Calculate $\mathbf{p} - \mathbf{q}$ in terms of x.

(b)   Find the value of

     (i) $|\mathbf{p}|$, the magnitude of vector $\mathbf{p}$.

     (ii) x such that $2\mathbf{p} = -3\mathbf{q}$.

Answer   *(a)* $\mathbf{p} - \mathbf{q}$ = _____   [1]

     (b)   *(i)* $|p|$ _____   [1]

         (ii) x = _____   [2]

19

18   The marks of 6 of the students who wrote a mathematics test are as follows:

15;   14;   9;   12;   11;   15.

(a)   Find the median mark for the 6 students.

(b)   A seventh student got x marks from the same test and the mean mark for the seven students was 13.

Find x, the mark of the seventh student.

Answer   *(a)*   _____   [1]

          (b)   _____   [3]

19   It is given that set

$$P = \{-11; \ -2; \ 0; \ 1; \ 2; \ 3; \ \sqrt{11}; \ 9; \ 17; \ 21.\}$$

(a)   A number is chosen at random from set P.

Find the probability that the number is either a negative number or a prime number.

(b)   Two numbers are chosen at random from set P one after the other, without replacement.

Find the probability that one is a perfect square and the other is a factor of 21.

Answer   *(a)*   _____   [2]

(b)   _____   [2]

21

20 **(a)** **(i)** Solve the inequality

$2(x - 3) < 7.$

(ii) Write down the largest perfect square that satisfies the inequality $2(x - 3) < 7$.

(b) Two similar bottles have heights 8 cm and 12 cm. The mass of the bottle of height 8 cm is 40 g.

Find the mass of the similar bottle that has a height of 12 cm.

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

(ii) _____ [1]

(b) _____ [2]

[Turnover

22

21
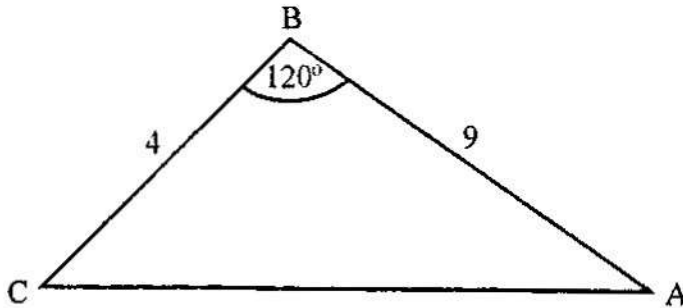
ABC is a triangle with AB = 9 cm, BC = 4 cm and $\widehat{ABC} = 120°$.

Use as much of the information given below as is necessary.
[tan 60° = 1, 73;   Sin 60° = 0, 87;   Cos 60° = 0, 5]

Find the

(a)   area of triangle ABC,

(b)   length of AC leaving the answer in surd form.

Answer   *(a)* _____ cm² [2]

(b) _____ cm [3]

22
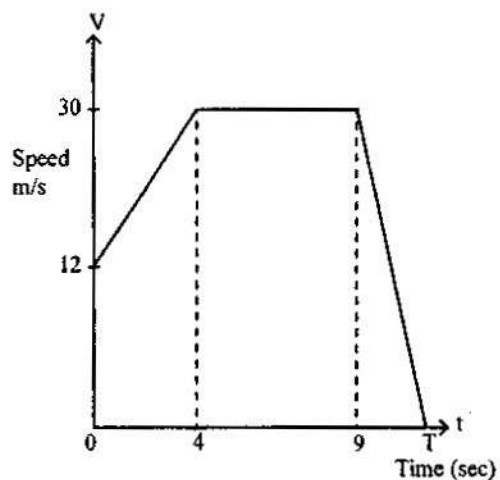
The diagram is the speed –time graph of an object whose initial speed is 12 m/s. The object accelerates uniformly for 4 seconds until it reaches a speed of 30 m/s. It then travels at this speed for 5 seconds and then decelerates at 6 m/s² until it comes to rest.

Calculate the

(a) acceleration from $t = 0$ to $t = 4$,

(b) distance travelled from $t = 0$ to $t = 9$,

(c) value of T, the total time taken for the whole journey.

Answer   *(a)* _____ [1]

             (b) _____ [2]

             (c) _____ [2]

[Turnover

23
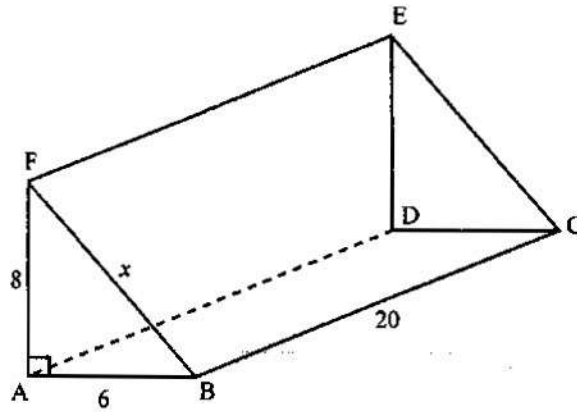
In the diagram, ABCDEF is a solid triangular prism. AB = 6 cm,
BC = 20 cm, AF = 8 cm, FB = x cm and $B\widehat{A}F = 90°$.

(a)   Find x.

(b)   Calculate the total surface area of the prism.

Answer   *(a)* _____ [2]

          (b) _____ [3]

25

24   **(a)**   Evaluate

      (i) $\log_3 45 - \log_3 5$,

      (ii) $\dfrac{\log\ 0,2}{\log\ 5}$.

  (b)   Express as a logarithm of a single number,

$3 \log 2 + \frac{1}{2} \log 81.$

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

           (ii) _____   [2]

      (b) _____   [2]

[Turn over

26

25 It is given that

$$3\begin{pmatrix} p & -1 \\ 0 & 4 \end{pmatrix} - \begin{pmatrix} 7 & q \\ -2 & 2r \end{pmatrix} = \frac{1}{2}\begin{pmatrix} 16 & 8 \\ 4 & -12 \end{pmatrix}$$

Find the value of

(i) p,

(ii) q,

(iii) r.

Answer   *(i)* _____ [2]

(ii) _____ [2]

(iii) _____ [2]

26
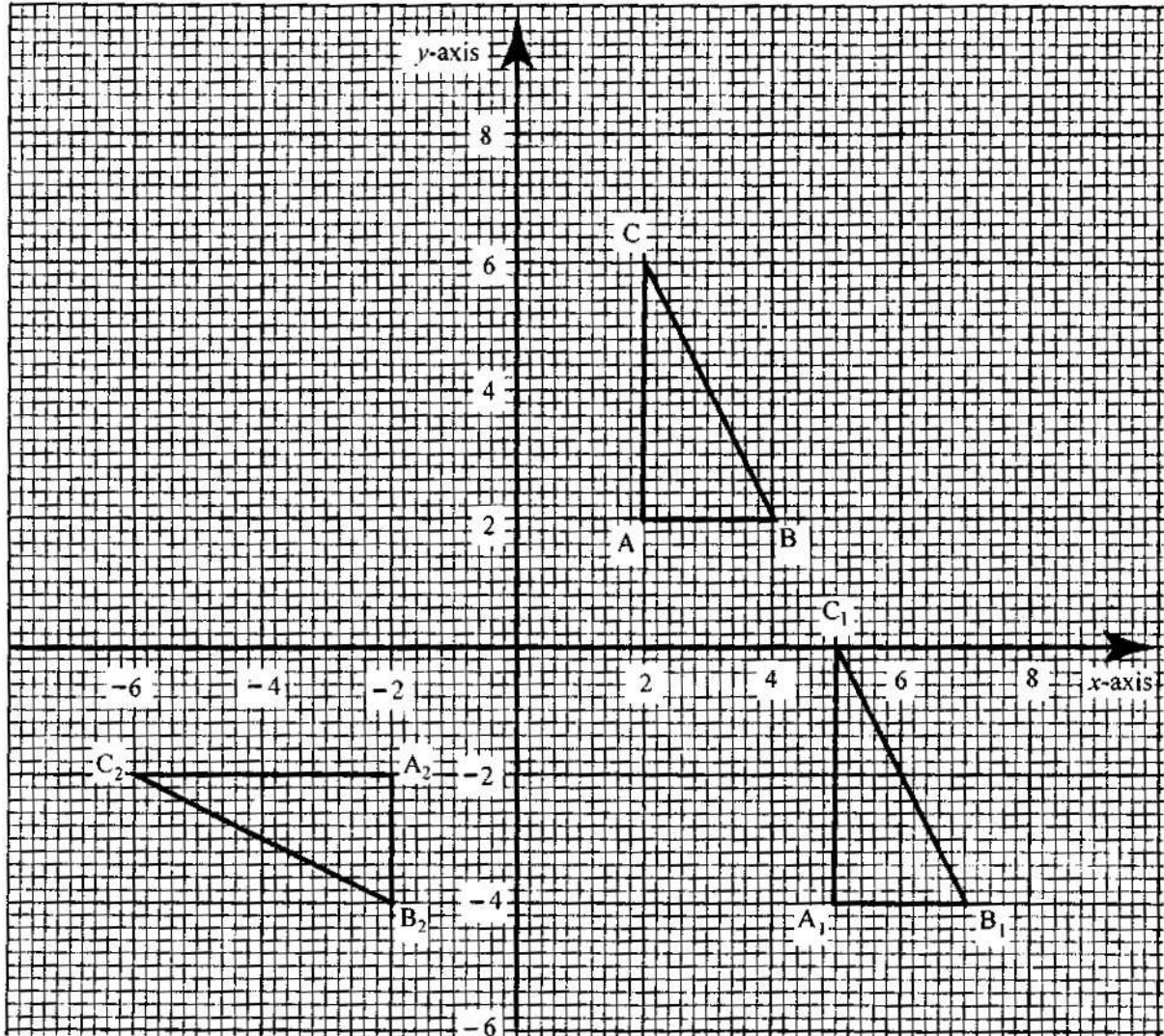
The diagram shows three triangles ABC, $A_1B_1C_1$ and $A_2B_2C_2$

(a) Triangle ABC is mapped onto triangle $A_1B_1C_1$ by a single transformation. Describe **fully** this transformation.

Answer   (a)   _____

                           _____

                           _____   [3]

[Turn over

28

26   **(b)**   Triangle ABC is mapped onto triangle $A_2B_2C_2$ by a reflection.

Find the

(i)   equation of the axis of reflection,

(ii)   matrix that represents this reflection.

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

(ii)   _____   [2]

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Ordinary Level

MATHEMATICS
PAPER 2

4030/2

JUNE 2018 SESSION   2 hours 30 minutes

Candidates answer on the question paper.
Additional materials: Geometrical instruments
                         Mathematical tables/ Electronic calculator

Allow candidates 5 minutes to count pages before the examination.

This booklet should not be punched or stapled and pages should not be removed.

TIME   2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your Name, Centre number and Candidate number in the spaces at the top of this page and your Centre number and Candidate number 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 *three* 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 or Electronic calculators may be used to evaluate explicit numerical expressions.

This question paper consists of 26 printed pages and 2 blank pages.

[Turn over

2

Section A [64 marks]

Answer *all* the questions in this section.

1   **(a)**   Simplify $0,8 + 7,2 \div 0,24$.

Answer: *(a)*   _____   [2]

(b)   By selling an article for \$45, a shopkeeper made a loss of 10 % on the cost price.

Calculate the cost price.

Answer: *(b)*   _____   [2]

3

1 **(c)** It is given that $f(k) = 2k^2 - 8$.

Calculate

(i) $f(-3)$,

(ii) the values of k for which $f(k) = 0$.

Answer: *(i)* _____ [2]

(ii) _____ or_____ [2]

2 **(a)**
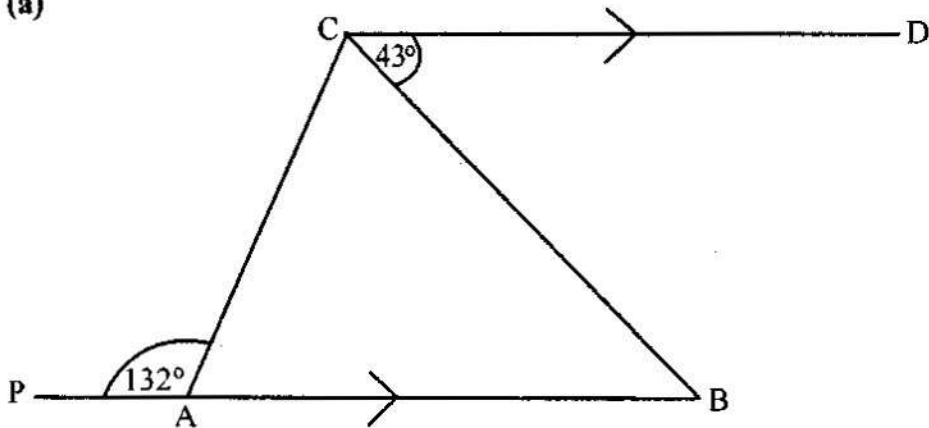
In the diagram, PAB is a straight line and is parallel to CD.
$P\hat{A}C = 132°$ and $B\hat{C}D = 43°$.

Calculate $A\hat{C}B$.

Answer: *(a)* _____ [2]

[Turn over

4

2   **(b)**   Factorise completely

     (i) $4a^2b - 20ab^2$,

     (ii) $3a^2 + 7a - 6$.

Answer: *(i)*   _____ [1]

             (ii)   _____ [2]

   (c)   It is given that $H = mp + \frac{1}{2}f^2p$.

     (i)   Calculate the value of H when $m = 2$, $p = 3$ and $f = -4$.

     (ii)   Make f the subject of the formula.

Answer: *(i)*   _____ [2]

             (ii)   _____ [3]

5

3   **(a)**   The cost of 3 kg of apples and 7 kg of bananas is $16.
The cost of 4 kg of apples and 5 kg of bananas is $17.
Calculate the cost per kg of apples and the cost per kg
of bananas.

Answer: *(a)*   *apples* $ _____

bananas $_____   [4]

(b)   W varies directly as x and inversely as the square root of u.

W = 6,   when $x = 2$ and $u = 9$.

(i)   Express W in terms of x and u.

(ii)   Find W when $x = 8$ and $u = 4$.

Answer: *(i)*   _____   [2]

(ii)   _____   [1]

6

3   (c)   Matrix $A = \begin{pmatrix} 4 & 2 \\ 3 & 1 \end{pmatrix}$ and matrix $B = \begin{pmatrix} 2 & 0 \\ 1 & -3 \end{pmatrix}$.

Calculate

(i) $A - 2B$,

(ii) AB,

(iii) A^{-1}, the inverse of matrix A.

Answer: *(i)* _____ [2]

(ii) _____ [2]

(iii) _____ [2]

7

4   **(a)**
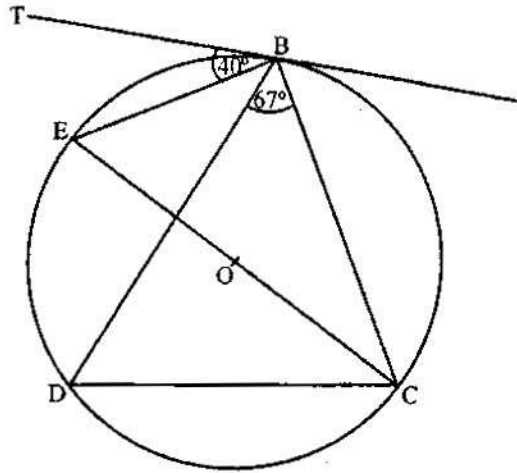
In the diagram, B, C, D and E are points on the circumference of a circle centre O. TB is a tangent to the circle at B, $\hat{CBD} = 67°$ and $\hat{EBT} = 40°$.

Calculate

(i)   EB̂D,

(ii) BĈE,

(iii) BÊC,

(iv) BD̂C.

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

(ii) _____ [1]

(iii) _____ [1]

(iv) _____ [1]

8

4   **(b)**   It is given that the Universal set, ξ is such that
$\xi = \{x: -3 \le x \le 3, x \text{ is an integer}\}$.

A and B are subsets of ξ such that

$A = \{x: -2 \le x < 2\}$ and

$B = \{x: -1 \le x \le 3\}$.

(i)   List the elements of   1.   **A**,

2.   **A' ∪ B'**. where A' is the complement of set A.

(ii)   Find $n(A \cap B)$.

Answer (b)   *(i)*   1.   _____ [2]

2.   _____ [2]

(ii)   _____ [1]

9

4   (c)   A polygon has *n* sides. The sum of the interior angles is equal to the sum of the exterior angles.

    (i)   Find the value of *n*.

    (ii)   State the name of the polygon.

Answer: *(i)*   _____ [2]

              (ii)   _____ [1]

10

5   (a)   Peter, John and James share a certain amount of money.

Peter gets $\frac{2}{3}$ of the amount of money,

John gets $\frac{3}{4}$ of the remainder and James gets $3,00.

Calculate the total amount of money shared.

Answer: *(a)* _____   [4]

11

5   (b)   Three men working at the same rate can dig a trench, 5m long, in 4 hours.

Calculate the time that two men working at the same rate would take to dig a similar trench, 5m long.

Answer: *(b)*   _____   [2]

(c)   Find the value of *n* given that

$$111_n = 7_{10}.$$

Answer: *(c)*   _____   [3]

12

6   Answer the whole of this question on page 13.

Use ruler and compasses only for all constructions and show clearly all the construction lines and arcs.

All constructions should be done on a single diagram. Line PQ has been drawn on page 13.

(a)   Construct

    (i)   triangle PQR in which PQ = 7,5 cm, $R\hat{P}Q = 90°$ and
        $P\hat{Q}R = 30°$,   [4]

    (ii)   the locus of points equidistant from Q and R,   [2]

    (iii)   a circle with diameter QR.   [1]

(b)   (i)   Measure and write down the length of the

        1.   radius of circle in a(iii),   [1]

        2.   side PR in triangle PQR.   [1]

    (ii)   Mark and label the points X and Y on the circle which
        are equidistant from Q and R.   [2]

    (iii)   Write down the special name given to quadrilateral PRYQ. [1]

DO NOT WRITE IN THIS SPACE

13

6   **Answer the whole of question 6 on this page.**

P |—————————————————— 7,5 cm ——————————————————| Q
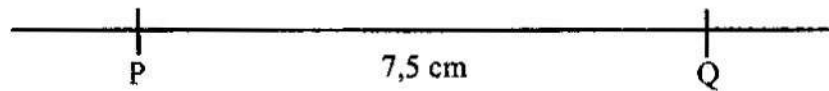
Answer   *(a)*   *(i)*   On the diagram   [4]

                           (ii)   On the diagram   [2]

                           (iii)   On the diagram   [1]

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

                                 2. _____   [1]

                         (ii)   on the diagram   [2]

                         (iii)   _____   [1]

14

SECTION B [36 marks]

Answer any *three* questions in this section.

Each question carries 12 marks.

7   (a)   An open cylindrical water container has an internal height of 1,5 m and internal diameter of 0,75 m.

Calculate the

(i)   volume of the container, in litres,

(ii)   total internal curved surface area of the container.

$$Take\ \pi\ =\ \frac{22}{7}$$

Answer   *(i)*   _____   [3]

(ii)   _____   [3]

15

7   (b)   (i)   Show that the equation

$\frac{1}{x} - \frac{1}{x+2} = \frac{1}{3}$ reduces to $x^2 + 2x - 6 = 0$.

[2]

(ii)   Solve the equation $x^2 + 2x - 6 = 0$, giving the answers correct to 2 decimal places.

(ii) $x = $ _____ or _____   [4]

[Turn over

8   The following is an incomplete table of values for $y = \frac{1}{2}(15 - x^2)$.

x	−4	−3	−2	−1	0	1	2	3	4
y	⸱ ⸱ ⸱	m	5,5	7	7,5	7	n	3	−0,5

(a)   Calculate the value of

(i)   m,

(ii)   n.

Answer (i) m = _____   [1]

(ii) n = _____   [1]

Answer this part of the question on the grid on page 17.

(b)   (i)   Draw the graph of $y = \frac{1}{2}(15 - x^2)$.   [4]

(ii)   Draw the line y = 2 to cut the graph at two points.   [1]

(c)   Use the graph to

(i)   find the equation of the line of symmetry of the curve,   [1]

(ii)   estimate correct to one decimal place, the solution of the equation $\frac{1}{2}(15 - x^2) = 2$,   [2]

(iii)   find the gradient of the graph of $y = \frac{1}{2}(15 - x^2)$ at the point where $x = 2$.   [2]

17

8
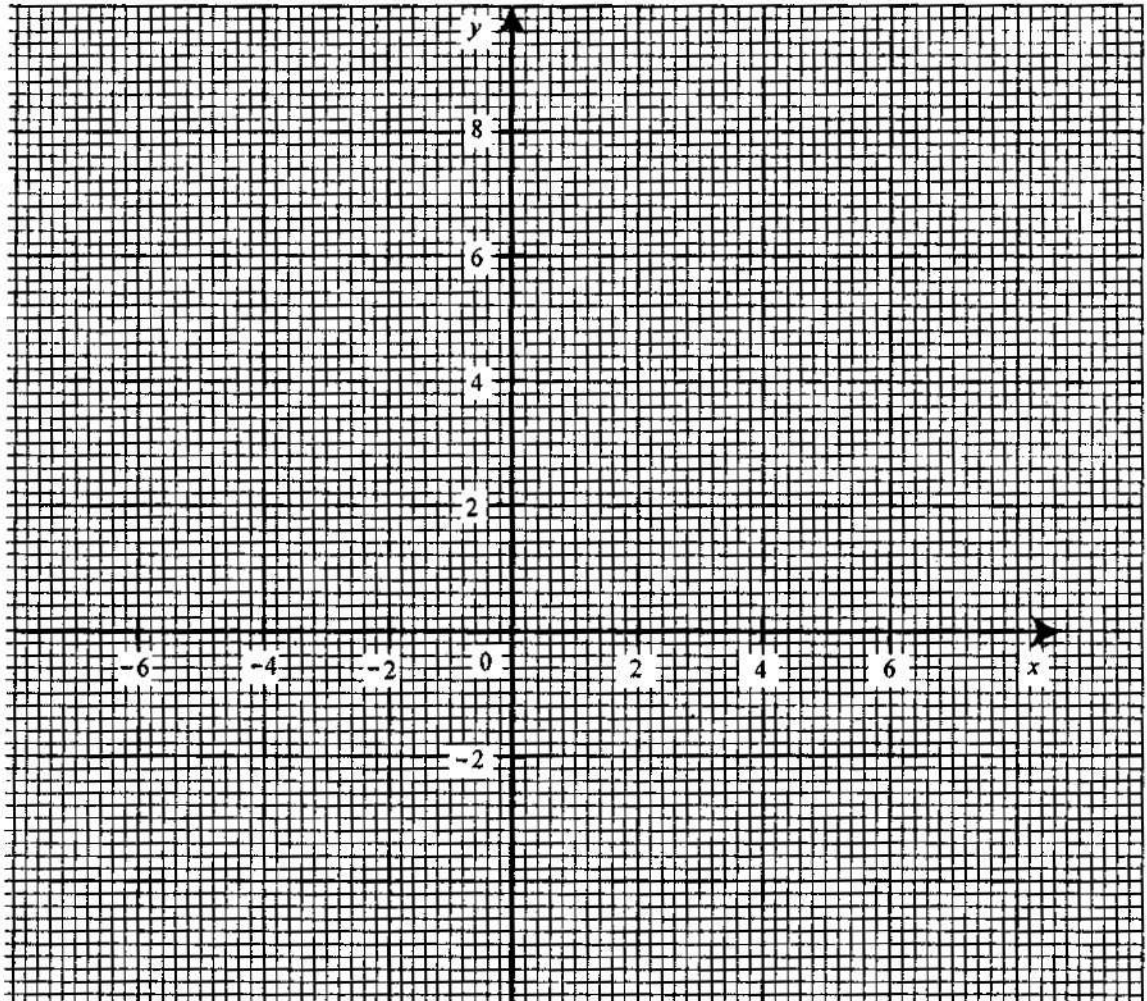
Answer (b) *(i)*   On the graph   [4]

         (ii) On the graph   [1]

    (c)   *(i)* _____   [1]
               <

         (ii) $x =$ _____ or _____   [2]

         (iii) _____   [2]

[Turn over

9   (a)   Three points P, X and Y are on level ground and are such that P is 200 m from X on a bearing of 064°. Y is on a bearing of 144° from P and is such that Y is due east of X.

Calculate the

(i)   length XY,

(ii)   distance P is north of X.

19

9   **(b)**   Joseph cycles at a speed of 5 metres per second.
Calculate the time, in hours, he takes to cycle a distance
of 18 km.

Answer (b) _____ hr   [2]

(c)   A television set has a marked price of $300. A 5 % discount
is given for cash payment. Calculate the cash price.

Answer (c) _____   [2]

20

9   (d)   Jane invested a certain amount of money at a rate of 12 %
            per annum simple interest. After 11 months the money had
            amounted to $555,00.

            Calculate the amount of money she invested.

            Answer (d) _____   [4]

10   **Answer the whole of this question on the grid on page 21.**

       (a)   (i)   Triangle ABC has vertices at A(1; 1), B(3; 1) and
                     C (1; 3).

                     Draw and label triangle ABC.   [1]

              (ii)   Triangle $A_1 B_1 C_1$ has vertices at A_1 (−2; −2),
                     B_1 (−6; −2), and C_1 (−2; −6).

                     Draw and label triangle $A_1B_1C_1$.   [1]

              (iii) Transformation S represents a stretch with invariant
                     line the x – axis and stretch factor 4.

                     Draw and label triangle $A_2B_2C_2$, the image of triangle
                     ABC under S.   [2]

              (iv)   Transformation R represents a rotation 90° clockwise
                     about the origin.

                     Draw and label the triangle $A_3B_3C_3$, the image of triangle
                     ABC under R.   [3]

       (b)   (i)   Describe **fully** the **single** transformation that maps
                     triangle ABC onto triangle $A_1B_1C_1$.   [3]

              (ii)   Find the matrix which represents the transformation R.   [2]

21

10   Answer the whole of question 10 on this page.
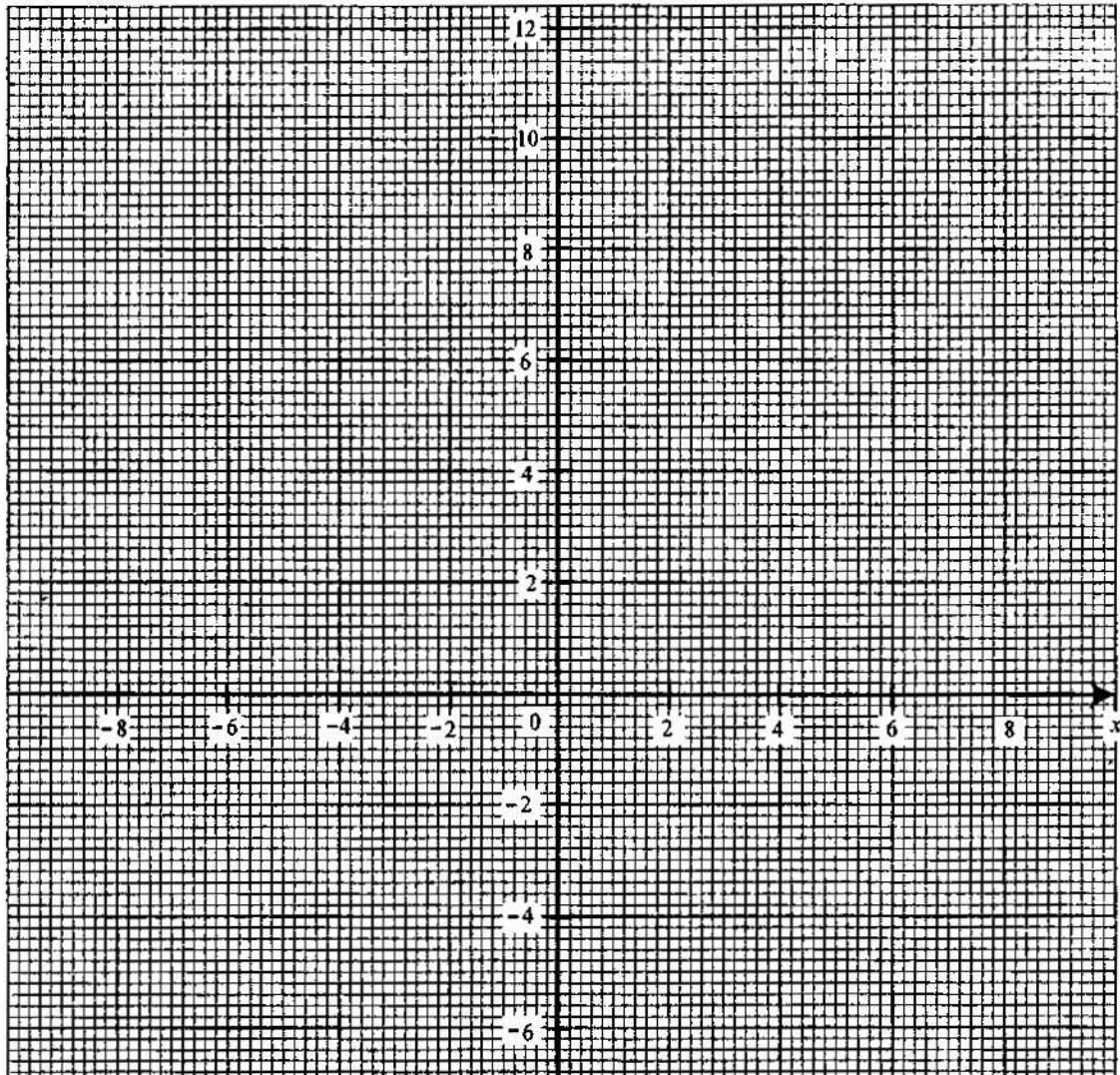
Answer (a)   *(i)*   On the graph   [1]
                (ii)   On the graph   [1]
                (iii) On the graph   [2]
                (iv)   On the graph   [3]

        (b)   *(i)*   _____

                        _____

                        _____   [3]

                (ii)

                                                                         [2]

22

11   The table shows the distribution of marks obtained by 30 pupils in a class test.

Mark (x)	$1 < x \leq 5$	$5 < x \leq 10$	$10 < x \leq 15$	$15 < x \leq 20$	$20 < x \leq 25$
Number of pupil (f)	4	8	5	6	7

(a)   (i)   State the modal class.

Answer   (a)   (i) _____ [1]

23

11   (a)   (ii)   The table shows entries used to calculate the mean of data using an assumed mean of 12,5.

Class centre (x)	Number of Pupils (f)	Deviation (x − 12, 5)	f(x − 12, 5)
3	4	−9,5	−38
7,5	8	−5	p
12,5	5	0	0
q	6	+5	+30
22,5	7	r	+70
	Total = 30		Total = S

Calculate the values of p. q, r and S.

(iii)   Hence or otherwise calculate, an estimate of the mean of the distribution.

Answer   *(a)*   *(ii)*   p = _____

q = _____

r = _____

S = _____ [4]

(iii) mean _____ [2]

[Turn over

24

11 (b) Two pupils are chosen at random from the class of 30 pupils. Calculate the probability that

(i) one has a mark in the range $10 < x \le 15$ and the other a mark of at most 10,

(ii) both pupils got marks that are more that 20.

Answer (b) (i) _____ [3]

(ii) _____ [2]

25

12   Answer the whole of this question on the grid on **page 26**.

    (a)   Draw the graphs of these inequalities by shading the **unwanted** region.

        (i) $2x + y \le 40,$ [2]

        (ii) $x + 2y \le 48,$ [2]

        (iii) $x \ge 0$ [2]

        (iv) $y > 5.$ [2]

    (b)   Mark R the region defined by the four inequalities in **(a)**.   [1]

    (c)   For integral values of x and y,

        (i)   find the coordinates of a point that gives a maximum value of $x + y$,   [2]

        (ii)   state the maximum value of $x + y$.   [1]

DO NOT WRITE IN THIS SPACE

26

12   (a)   **Answer the whole of question 12 on this page.**
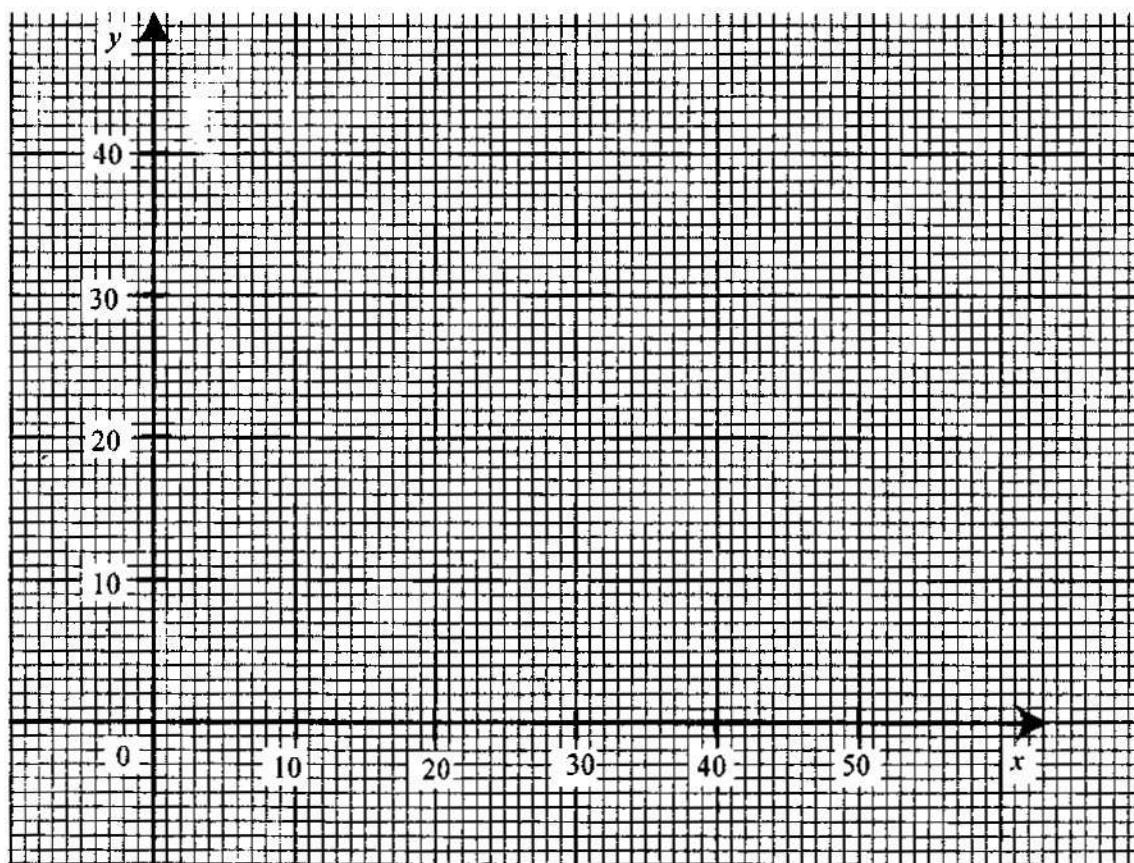
Answer   (a)   (i)   On the graph   [2]
                 (ii)   On the graph   [2]
                 (iii) On the graph   [2]
                 (iv)   On the graph   [2]

         (b)   On the graph   [1]

         (c)   (i)   _____   [2]

                (ii)   _____   [1]

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).

Answer all questions.

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

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

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

   b)   Express

   i) $\dfrac{6}{25}$ 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:

$\dfrac{3}{7}$; 11; $\sqrt{\dfrac{3}{2}}$; 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 km² 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]**

4

6.
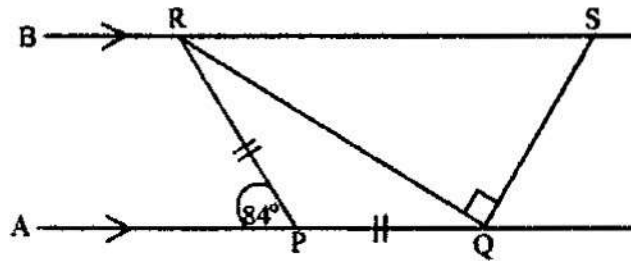
In the diagram AQ and BS are parallel lines such that

$PQ = PR$, $A\hat{P}R = 84°$ 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]

7

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 $\dfrac{2a + 6}{a - 3} \div \dfrac{a + 3}{a^2 - 2a - 3}$.

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]**

11

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]**

12

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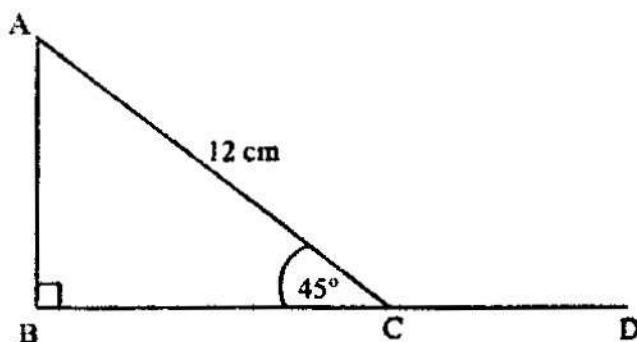
In the diagram, triangle **ABC** is right angled at **B**, **BCD** is a straight line, **AC** = 12 cm and $B\hat{C}A = 45°$.

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

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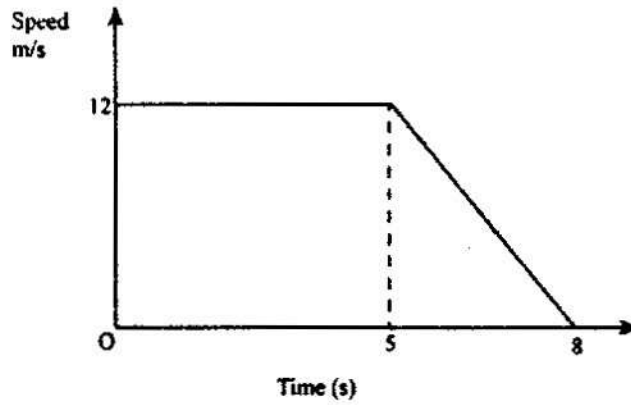
The graph shows the motion of an athlete running on level ground at a constant speed of 12 m/s for 5 seconds. The athlete then retards uniformly to rest after a further 3 seconds.

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]**

[Turn over

23.
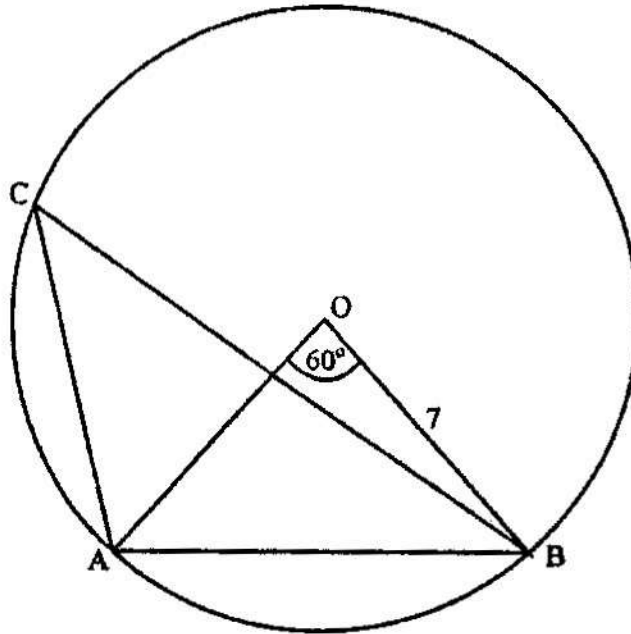
In the diagram points **A**, **B** and **C** are on the circumference of circle centre **O**, OB = 7cm and $A\hat{O}B = 60°$.

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]**

19

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]

[Turn over

20
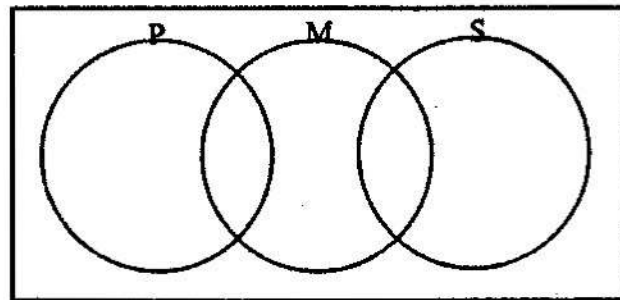
25.
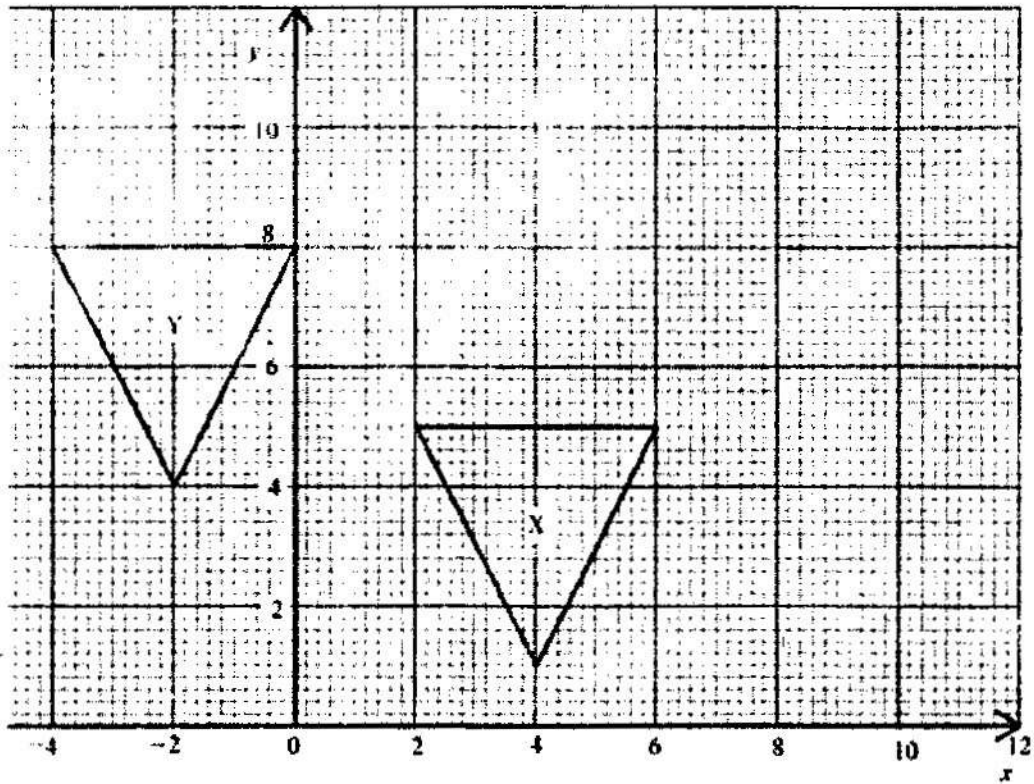
The graph shows triangles X and Y.

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.
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 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).

2

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 $P = \dfrac{1}{2}[a + d(a + d)],$

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

   (b) .... [2]

   c) Express $\dfrac{x - 3}{x - 2} - \dfrac{x + 2}{x + 3}$ 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]

5

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]**

[Turn over

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 $\xi = \{x : 1 \leq x \leq 10, \ x \ is \ an \ integer.\}$, 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.
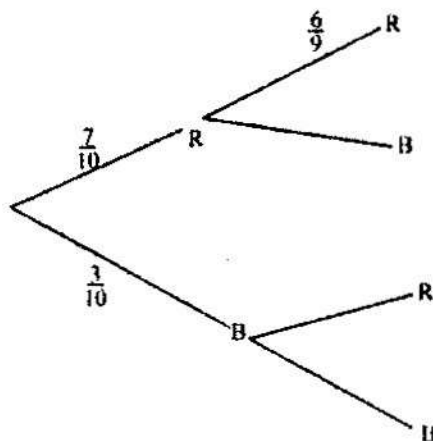
   (c)(i) .... [2]

   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.
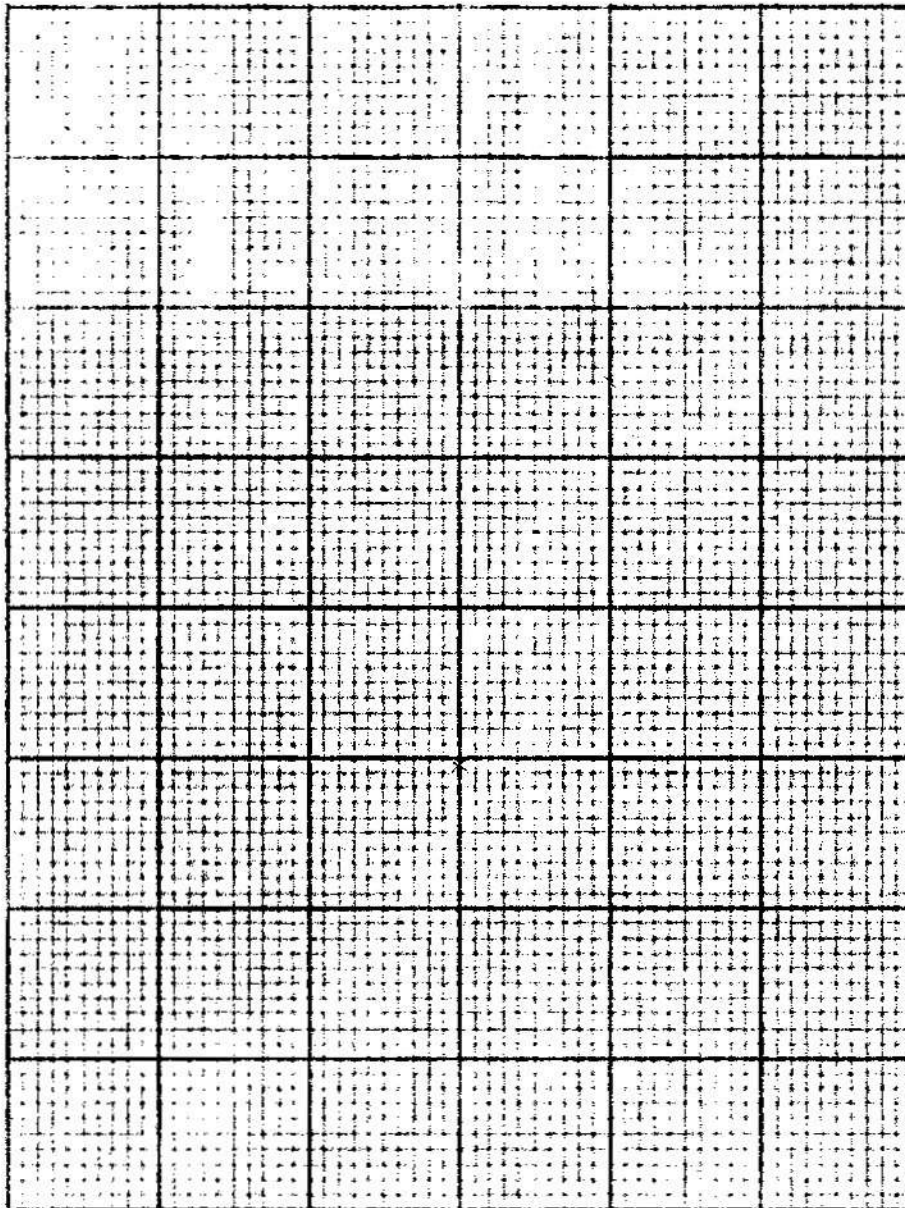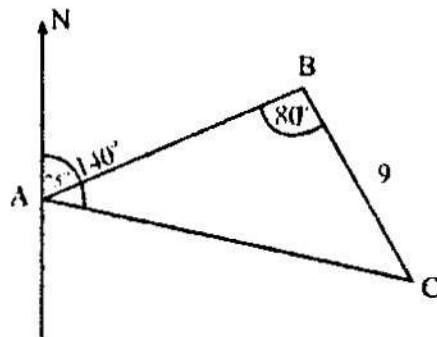
[4]

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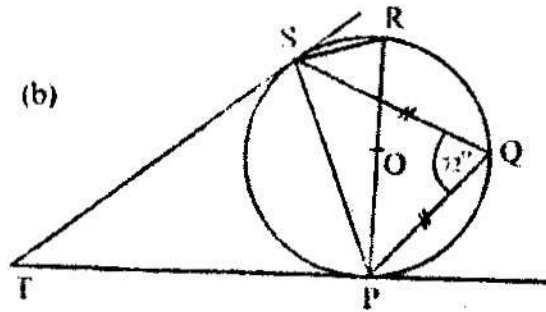
In the diagram P, Q, R and S are points on the circumference of a circle centre O. POR is the diameter of the circle, PT and ST are tangents to the circle, $S\hat{Q}P = 72°$ and chords PQ and QS are equal.

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 $y = \dfrac{1}{2}$.

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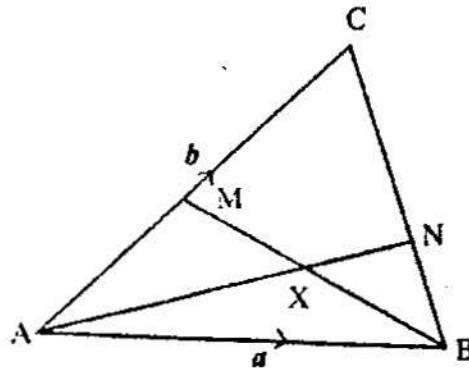
In the diagram M is the midpoint of AC. N lies on BC such that $BN = \frac{1}{3} BC$,

$\vec{AB} = a$ 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]

15

b) Given that $\vec{BX} = h\vec{BM}$, express $\vec{AX}$ in terms of a, b and h.

(b) .... [2]

c) Given also, that
$\vec{AX} = k\vec{AN}$, express $\vec{AX}$ 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]

16

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 $-6 \leq y \leq 7$.
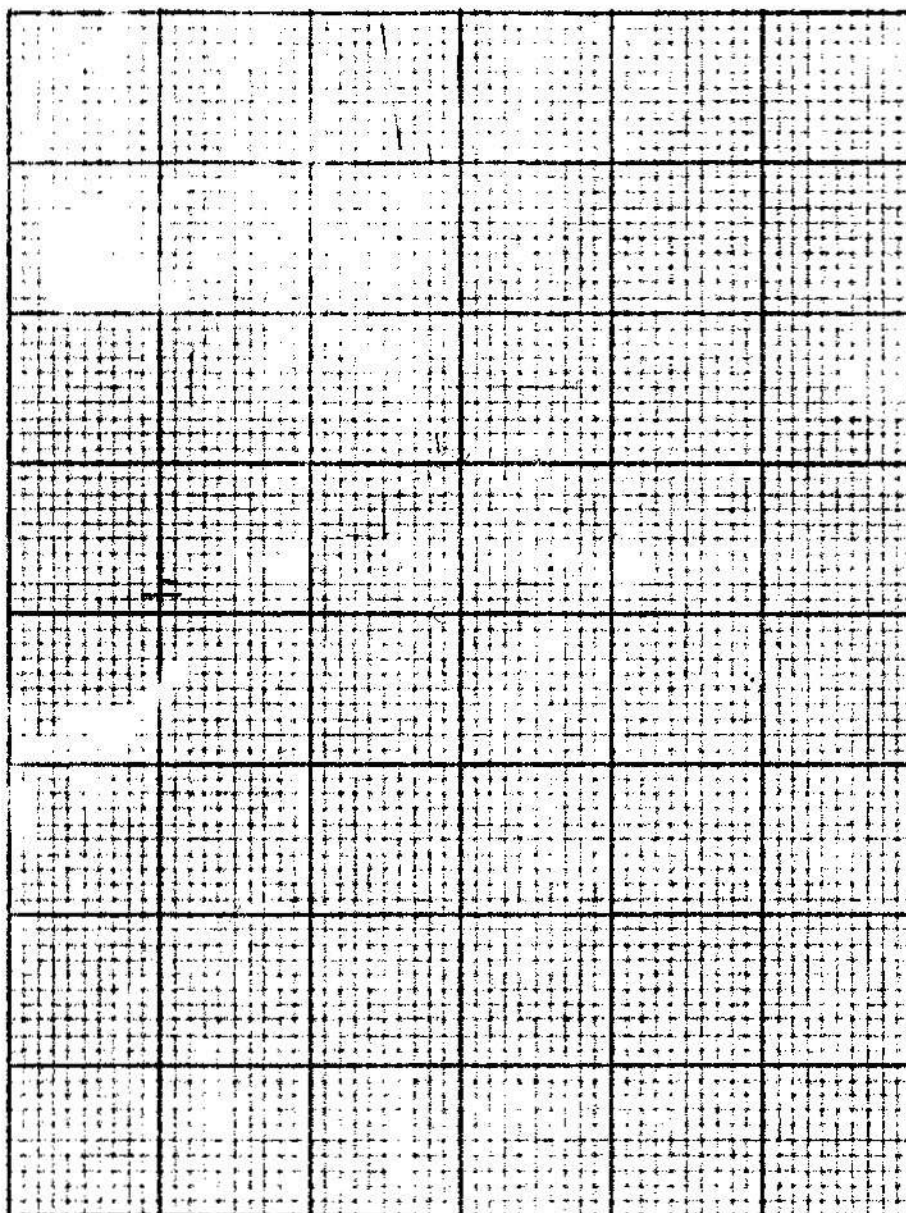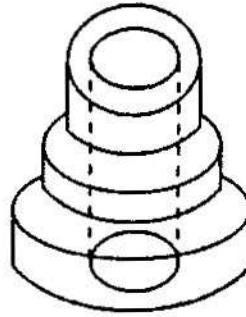

i)   Draw the graph of $y = 2x + 3 - x^2$.   [4]

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 / cm³,

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

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

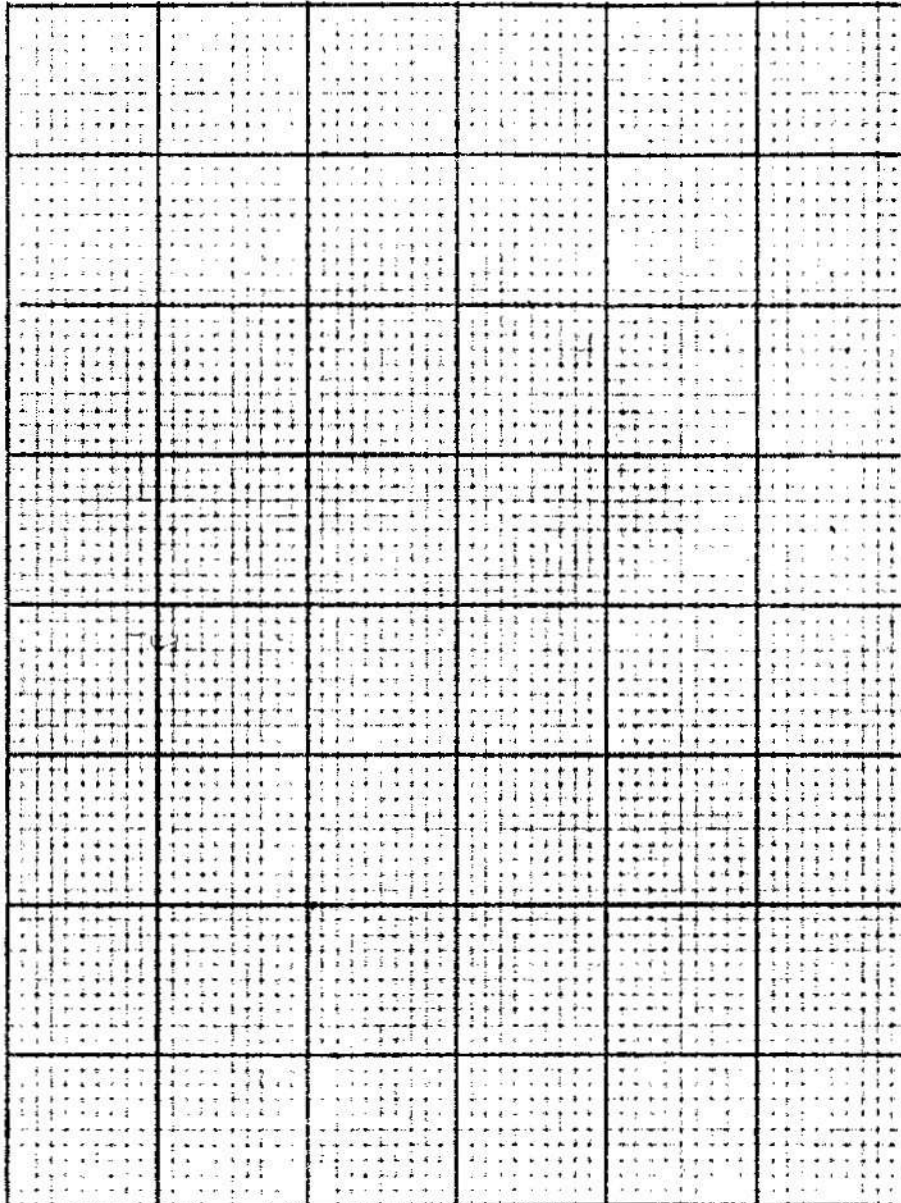(a)(iii) .... **[2]**

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]

20

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 $\begin{pmatrix} ' & ' \\ ., & , \end{pmatrix}$.

    (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]**