For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4004/1

PAPER 1

JUNE 2019 SESSION 2 hours 30 minutes

Additional materials:
Candidates answer on question paper
Geometrical instruments

Allow candidates 5 minutes to count pages before the examination.

TIME 2 hours 30 minutes

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

Mathematical tables or electronic calculators should not be brought in the examination room.

INFORMATION FOR CANDIDATES

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

Answer all questions.

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

1. Express

a) $\frac{12}{25}$ as a decimal fraction,

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

b) $\frac{2}{5}$ as a percentage,

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

c) 0,0375 as a fraction in its lowest terms.

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

2. Write down the next term in each of the following sequences.

a) 1 ; 4 ; 9 ; 16 ; 25 ; 36 ; _ _ _

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

b) $\sqrt{2}; \sqrt{3}; \sqrt{5}; \sqrt{7}; \sqrt{11};$ _ _ _

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

c) 16 ; 8 ; 4 ; 2 ; 1 ; _ _ _

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

3. Three girls aged 12 years, 13 years and 15 years share \$100,00 in the ratio of their ages.

Calculate the amount of money that each girl receives.

Answer .....

.....

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

4. **a)** Convert

i) 434_5 to base ten,

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

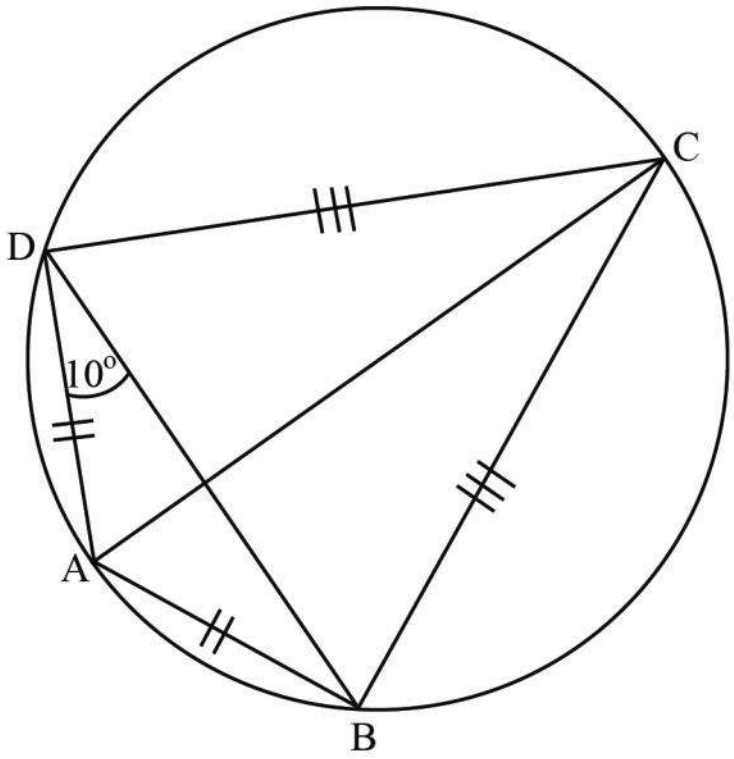
ii) 75_{10} to base two.

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

b) Evaluate $377_8 + 411_8$ leaving the answer in base 8.

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

5.



In the diagram, ABCD is a cyclic quadrilateral in which AB = AD and BC = DC.
AC is the diameter of the circle and AD$\hat{}$B = 10°

a) State the special name given to the cyclic quadrilateral ABCD.

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

b) Find

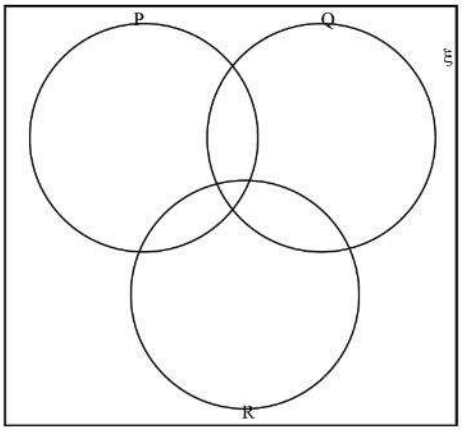
i) $A\hat{C}D$

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

ii) $A\widehat{D}C$

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

6.



The Venn diagram shows the universal set ξ and subsets P, Q and R.

In the Venn diagram shade the set $(P' \cap R) \cup (R' \cap Q)$.

Answer in the diagram **[3]**

7. **a)** Convert 647 cents to dollars.

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

b) The exchange rate for converting United States dollars to South African rand is US$1:R13,80.

Calculate the equivalent of US$75,90 in Rands.

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

8. Solve the simultaneous equations: $5x - 2y = 26$
$3x + 4y = 0$

Answer .....

[3]

.....

9. The sides of a parallelogram are of lengths 10cm and 8cm. One of the interior angles of the parallelogram is 150°.

Calculate the area of the parallelogram.

Use as much of the information given below as is necessary.

$[\tan 30 = 0,577; \cos 30 = 0,866; \sin 30 = 0,5]$

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

10. A box contains 20 sweets which are identical in shape and size except for colour.
Eight of the sweets are yellow and twelve are green.

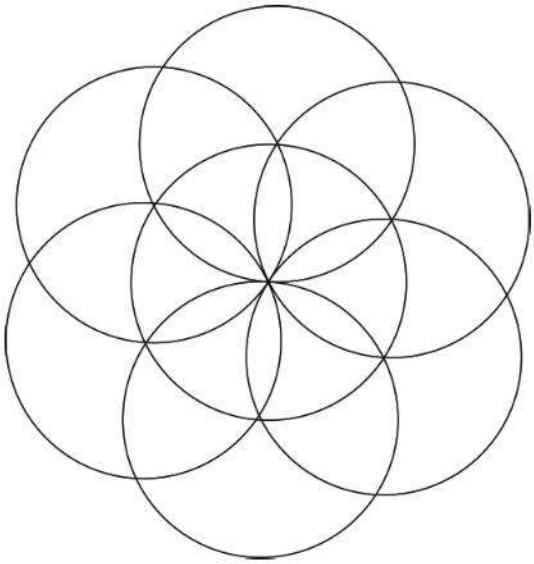
a) Calculate the probability of picking a yellow sweet.

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

b) Two sweets are picked at random from the box.
Calculate the probability that the sweets are of the same colour.

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

11.



In the diagram, all the circles are of equal radii.

State the

a) total number of circles,

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

b) number of lines of symmetry,

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

c) order of rotational symmetry.

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

12. It is given that log6 = 0,7781 *and* log5 = 0,6990

Calculate

a) log30,

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

b) log1200000.

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

13 a) Calculate the size of one exterior angle of an 18-sided regular polygon.

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

b) Calculate the sum of the interior angles of a heptagon (7-sided polygon).

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

14. The number of people, N, who favour a certain type of energy drink varies directly as the population size S. In a population of 1000 people, only 40 people were reported to favour that type of energy drink.

a) Form an equation connecting *N* and S.

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

b) Find the population size, □ from which 180 people favour that type of energy drink.

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

15. In a rectangle ABCD, AB = 12 cm and BC = 5 cm.

Express as a common fraction,

a) tan $A\hat{C}D$,

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

b) cos $D\hat{A}C$,

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

c) sin $B\hat{D}C$,

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

16. The masses of 6 bags of mealie- meal on the shelf of a shop were as follows:
5 kg; 5 kg; 10 kg; 10 kg; 10 kg; 20 kg.

Find the

a) modal mass,

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

b) median mass,

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

c) mean mass.

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

17. **a)** Factorise completely

i) $p^2 - 4$

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

ii) $2p^2 + 7p + 6$

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

b) Hence or otherwise find the Highest Common Factor (H.C.F.) of $p^2 - 4$ and $2p^2 + 7p + 6$

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

18. A right circular cone has a base diameter of 24 cm and a slant height of 15 cm. Calculate the

a) vertical height of the cone,

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

b) volume of the cone in terms of π .

[volume of cone = $\frac{1}{3}\pi r^2 h$ **]**

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

19. It is given that $f(x) = 3x^2 - 2x - 8$
Find

a) $f(-4)$,

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

b) the values of x for which $f(x) = 0$.

Answer(b) .....

[3]

.....

20. Solve the equations:

a) $x^{\frac{2}{3}} = 4$

Answer(a) .....

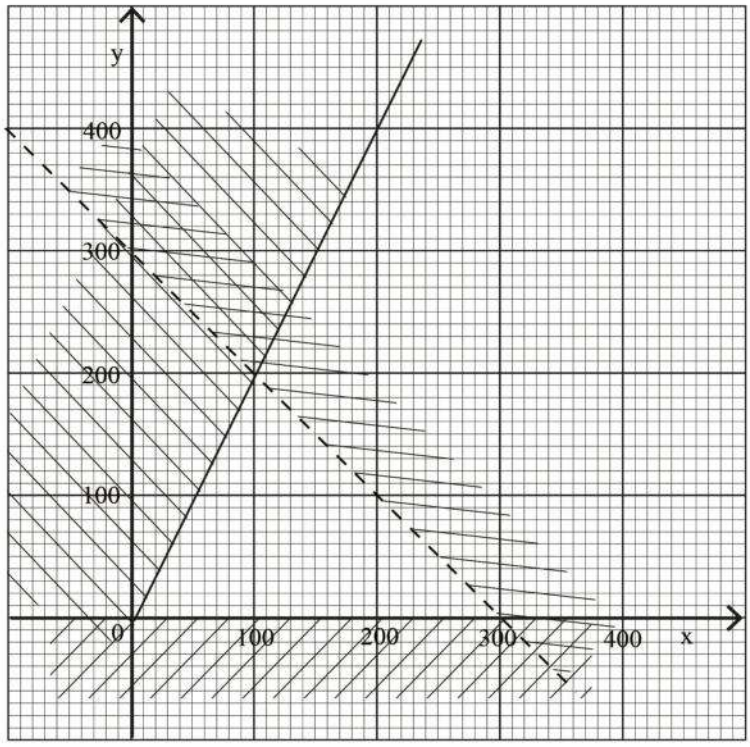
[2]

.....

b) $\dfrac{2}{x-2} = \dfrac{3}{x+2}$

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

21.



The diagram shows a linear programming region which can best be described using three inequalities.

One of the inequalities is $y \geq 0$.

a) Find the other two inequalities shown in the graph.

Answer(a) .....

[2]

.....

b) Find the maximum value of $x + y$, given that x and y are integers that satisfy the three inequalities.

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

22. a) Express in standard form

i) 618 000,

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

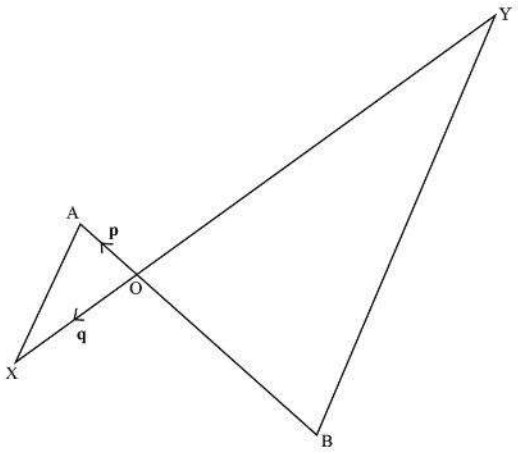
ii) 0,000 423.

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

b) Evaluate $(8,76 \times 10^{-2}) + (7,89 \times 10^{-2})$ leaving the answer in standard form.

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

23.



The diagram shows two intersecting straight lines AOB and XOY.

$\boldsymbol{OA} = \boldsymbol{p}$ and $\boldsymbol{OX} = \boldsymbol{q}$

$\frac{AO}{OB} = \frac{XO}{OY} = \frac{1}{3}$

a) express in terms of p and/ or q

i) **AX**

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

ii) **BY**

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

b) State **any two** relationships between the lines AX and YB.

Answer
(b) .....

.....

.....

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

24. Moyo village is 5 km away from Dube village on a bearing of 020°.
Ncube village is 6 km away from Dube village on a bearing of 060°.

a) Find the bearing of Dube village from Moyo village.

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

b) Find the distance from Moyo village to Ncube village, leaving the answer in surd form.

Use as much of the information given below as is necessary.

[cos 40° = 0,77 sin 40° = 0,64 tan 40° = 0,84]

Answer(b)

[3]

.....

25. Two similar bottles are of heights 8 cm and 16 cm.

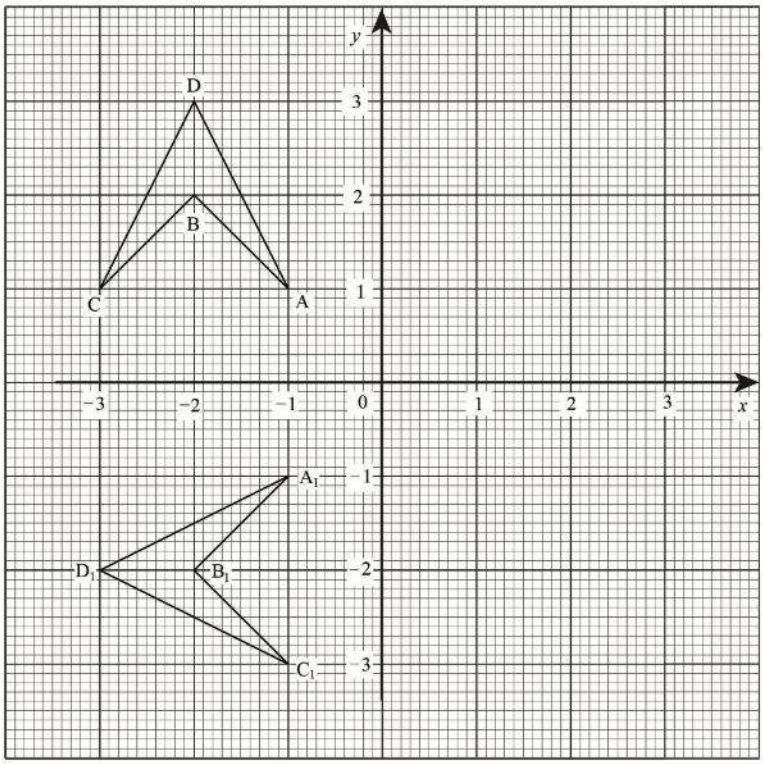
a) The bases of the similar bottles are also similar. The surface area of the base of the smaller bottle is 1,44 cm^2.
Find the surface area of the base of the bigger bottle.

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

b) Find the volume of the smaller bottle if the volume of the bigger bottle is 16 cm^3.

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

26.



The diagram shows two quadrilaterals ABCD and $A_1B_1C_1D_1$ on the Cartesian plane.

a) Describe fully the single transformation which maps ABCD onto $A_1B_1C_1D_1$.

Answer(a) .....

.....

.....

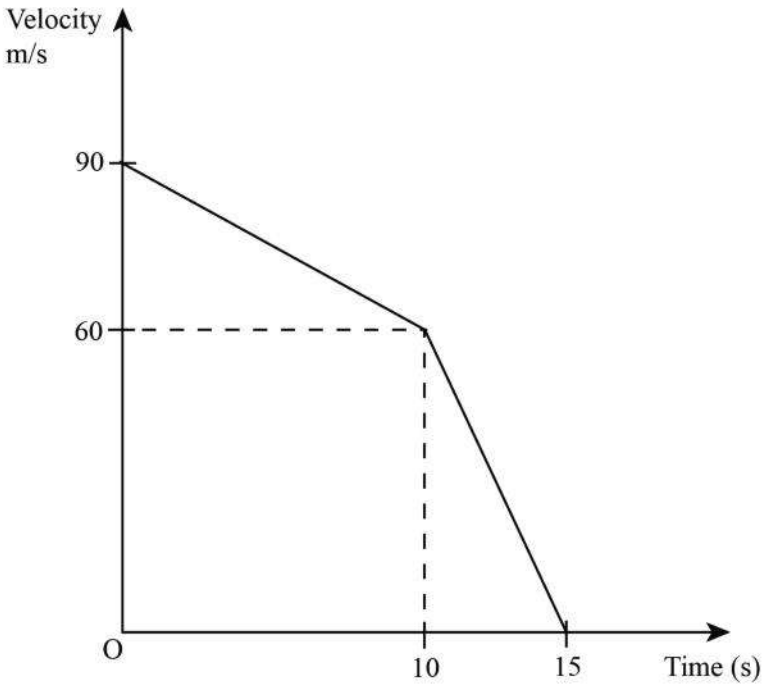
..... **[3]**

b) Point A_2 (1; –2) is the image of A under a translation.

Find the translation vector.

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

27.



The diagram is the velocity – time graph of an object which decelerates uniformly from a velocity of 90 m/s to a velocity of 60 m/s in 10 seconds. It then decelerates uniformly to rest in a further 5 seconds.

Calculate the

a) total distance covered by the object during the 15 seconds,

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

b) average velocity of the object during the 15 seconds,

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

c) deceleration of the object during the last five seconds.

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

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4004/2

PAPER 2

JUNE 2019 SESSION 2 hours 30 minutes

Candidates answer on the question paper

Additional materials:
Mathematical tables
Electronic Calculator
Geometrical Instruments
Graph paper (if needed)

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.
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.

SECTION A (52 Marks)

Answer **all** questions in this section

1. **a)** Write down the next term in the sequence below.

$$\frac{1}{3} \; ; \; \frac{2}{4} \; ; \; \frac{3}{5} \; ; \; \frac{4}{6} \; ; \; \ldots$$

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

b) Express 10 as a **sum** of **two** different prime numbers.

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

c) **i)** Increase \$105 by 12%.

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

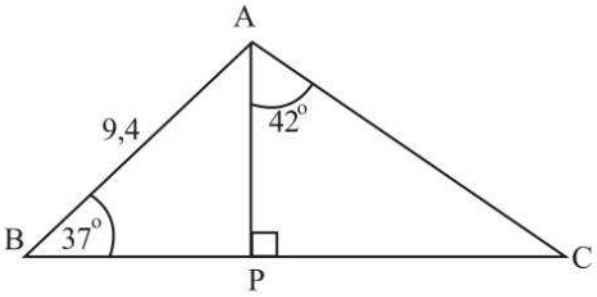
ii) Tendai and Chipo share \$105,00 in the ratio 4 : 3 in that order.
Find Tendai's share and Chipo's share.

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

2. **a)** Sin $\theta = \cos 40°$.
Find the 2 possible values of θ if $0° < \theta < 180°$.

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

b)



In the diagram, **ABC** is a triangle in which **AP** is perpendicular to **BC**.
AB = 9,4 cm, $A\hat{B}C = 37°$ and $P\hat{A}C = 42°$.

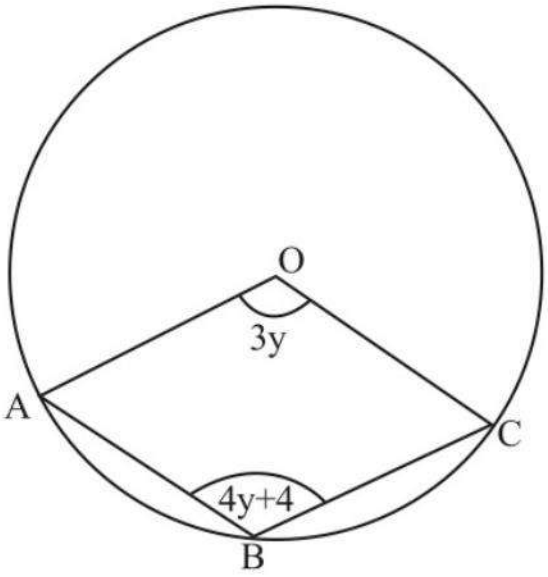
i) Calculate the length of **AP**.

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

ii) Calculate the length of **AC**.

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

c)



In the diagram above A, B and C are points on the circumference of a circle centre O. $A\hat{O}C = 3y$ and $A\hat{B}C = 4y + 4$.

i) Write down an expression, in terms of y for reflex $A\hat{O}C$.

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

ii) Find the value of y.

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

3. **a)** Tariro bought US \$7,00 for 91,70 Pula from a bank.

i) Find the exchange rate in the form US \$1 : mPula.

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

ii) The bank charged 1% commission for the transaction.
Calculate the amount of money Tariro received.

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

b) In a sale, the original price of a suit is reduced by 16% to \$210.
Calculate the original price of the suit before the sale.

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

c) William invested \$P, at a rate of 3% per annum simple interest.
After 5 years he got \$2010 simple interest.
Calculate the value of \$P.

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

d) John invested \$600 for 3 years at 4% per annum compound interest.
Calculate the total amount he received after 3 years.

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

4. **a)** Express $3 - \frac{x+2}{x-1}$ as a single fraction in its simplest form.

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

b) It is given that the functions $f(x) = x^2 + 3x - 8$,
$g(x) = 3x + 1$ and $h(x) = 2^x$
Find the

i) values of x for which $f(x) = g(x)$.

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

ii) value of x given that $h(x) = 0{,}25$.

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

c) Given that $\sqrt{ax+b} = d$,
express x in terms of a, b and d.

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

5. **Answer the whole of this question on the plain space below.**
User 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) Triangle ABC is such that AB=BC=7 cm and $A\hat{B}C = 120°$.

Construct on the blank space on **page 10** the

i) triangle ABC ,

Answer (a)(i) on the diagram **[3]**

.....

ii) bisector of $A\hat{B}C$,

Answer (a)(ii) on the diagram **[2]**

.....

iii) perpendicular bisector of side BC.

Answer (a)(iii) on the diagram **[2]**

.....

b) Point D is on the same side of AB as C and is such that AD = 7 cm and $B\hat{A}D = 45°$.

.

i) Construct $B\hat{A}D$.

Answer (b)(i) on the diagram **[2]**

.....

ii) Mark and label point D.

Answer (b)(ii) on the diagram **[1]**

.....

iii) Shade the region inside the triangle, on the same side of AB as C, which contains the points which are nearer BC than BA and nearer B than C.

[2]

Answer (b)(iii)on the diagram

.....

SECTION B (48 Marks)

Answer **any four** questions from this section.

Each question carries **12 marks.**

6. **a)** The universal set ξ, has subsets P and Q such that $n(\xi) = 59$, $n(P) = 15$, $n(Q) = 35$ and $n(P \cup Q)' = 9$

Write down

i) $n(P \cap Q)$,

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

ii) $n(P \cup Q)$.

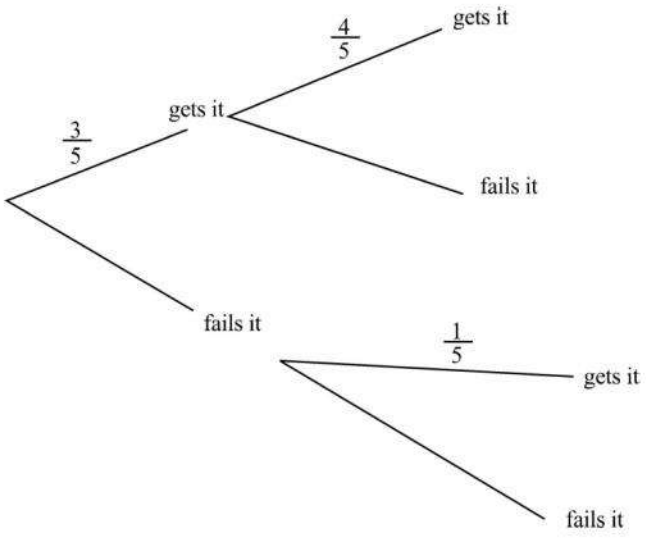
Answer **(a)(ii)** ..... **[1]**

b) In a test the probability that a learner gets the first question correct is $\frac{3}{5}$

If the learner gets it correct the probability of getting the second one correct becomes $\frac{4}{5}$.

If the learner fails the first question, the probability of getting the second one correct becomes $\frac{1}{5}$.

i) Complete the probability tree diagram.



Answer **(b)(i)** on the diagram ..... **[3]**

ii) Hence or otherwise find the probability that the learner who answers two questions, gets both questions correct.

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

iii) Hence or otherwise find the probability that the learner, who answers two questions, gets none of the two questions correct.

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

iv) Hence or otherwise find the probability that the learner, who answers two questions, gets only one of the questions correct.

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

7. **a)** **i)** Solve the following inequalities giving the answer in the form $a \leq x < b$ where a and b are constants to be found:
$5x - 13 \leq x - 6 < 9 + 4x$

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

ii) Illustrate the solution on a number line.

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

iii) Write down the smallest integer value of x that satisfies the inequalities.

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

b) Triangle ABC is such that, $A\hat{B}C = 90°$,
AB = $(x + 2)$cm and AC = $(2x + 3)$ cm.

i) Write down an expression in terms of x , for Sin $A\hat{C}B$.

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

ii) Given that $sinA\hat{C}B = \frac{9}{16}$ form an equation in x.

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

iii) Solve the equation in (b)(ii).

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

iv) Hence find the length of side AC.

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

v) Hence, calculate the length of side BC.

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

8. The following is an incomplete table of values for the function $y = x^2 - 4x$

x	– 2	– 1	0	1	2	3	4	5	6
y	12	5	0	p	– 4	– 3	0	q	12

a) Find the values of

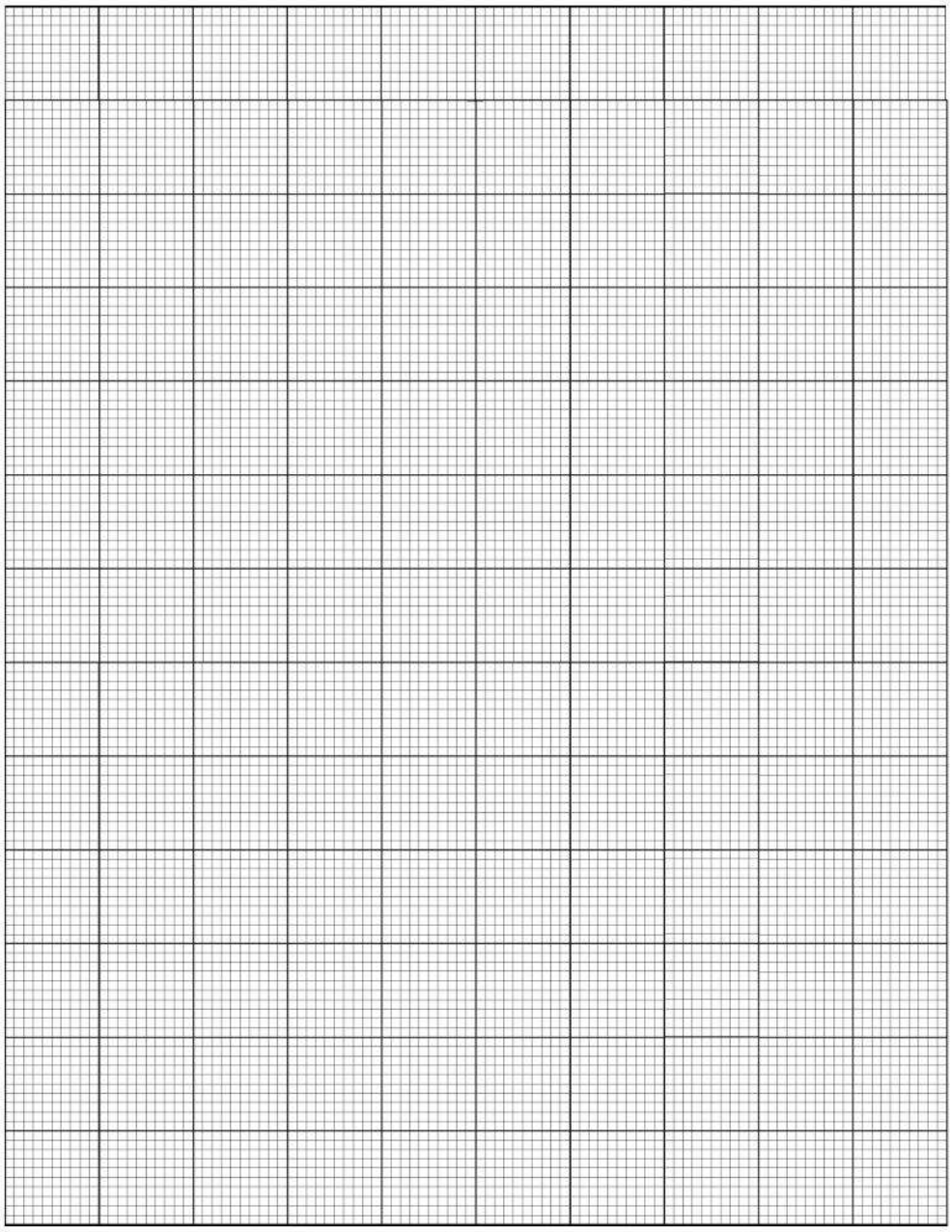
i) p ,

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

ii) q.

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

Answer parts (b) and (c) of the question on the grid.



b) **i)** Draw the graph of $y = x^2 - 4x$ on the grid provided using a scale of 2 cm to 1 unit on the x axis and 2 cm to 2 units on the y axis.

Answer (b)(i) on the graph ..... **[4]**

ii) On the same grid draw the graph of $y = 3 - x$.

Answer (b)(ii) on the graph ..... **[2]**

c) Use the graph to

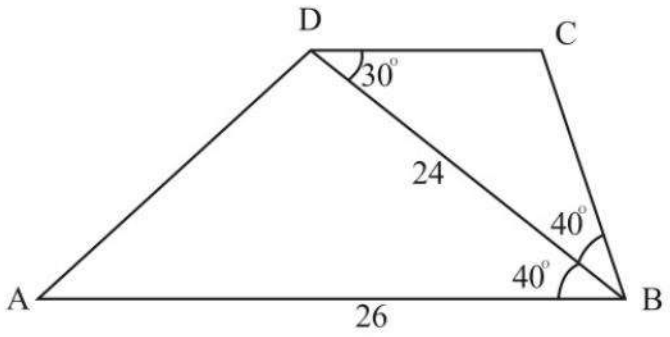
i) solve the equation $x^2 - 4x = 3 - x$,

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

ii) find the equation of the line of symmetry of the curve $y = x^2 - 4x$.

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

9.



In the diagram, ABCD is a quadrilateral in which BD is a diagonal. AB = 26cm, BD = 24cm, $A\hat{B}D = C\hat{B}D = 40°$ and $C\hat{D}B = 30°$.

Calculate the

a) area of triangle ABD,

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

b) length of AD,

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

c) length of BC,

Answer(c) ..... **[4]**

d) shortest distance from C to BD.

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

10. The table shows information about the heights of a group of 42 learners.

Height (h) cm	$150 < h \leq 160$	$160 < h \leq 165$	$165 < h \leq 180$	$180 < h \leq 190$
Frequency	5	9	18	10
Frequency Density	0, 5	1, 8	1, 2	1

a) State the

i) modal class,

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

ii) class that contains the median height,

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

iii) class that contains the lower quartile.

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

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

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

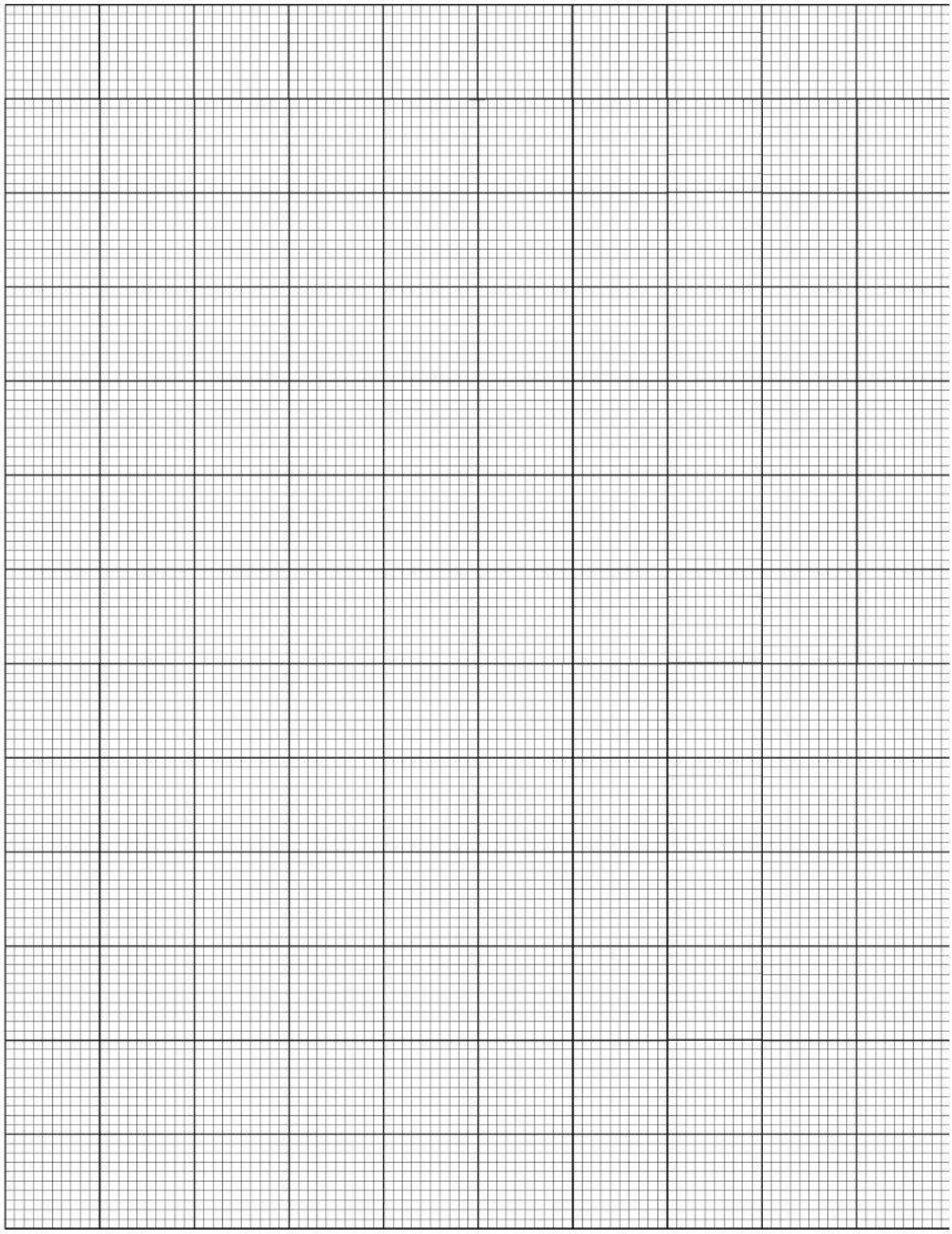
c) Two learners are chosen at random from the group.

Find the probability that both have heights that are more than 160 cm but less than or equal to 180 cm.

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

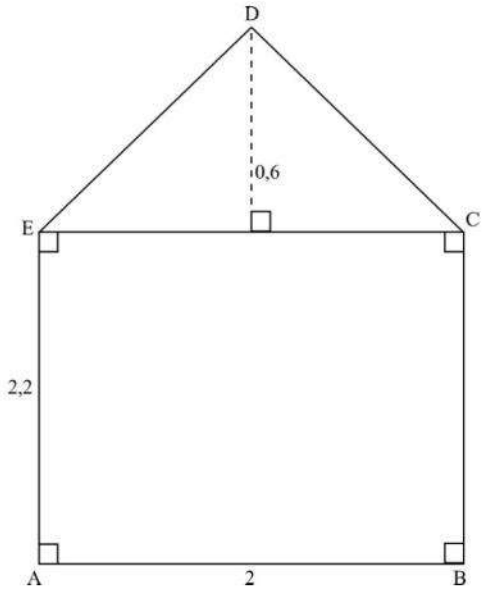
d) **Answer this part of the question on the grid.**

Using a scale of 2 cm to 5 units on the Height axis and 2 cm to 0,5 units on the Frequency Density axis, draw a histogram to show the information.



Answer (d) On the graph ..... **[3]**

11.



The diagram shows the cross-section of a garden shed. The cross-section ABCDE is made up of a rectangle measuring 2*m* by 2,2*m* and an isosceles triangle with a perpendicular height of 0,6*m* and a base of 2*m*.

a) Calculate the area of the cross-section.

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

b) If the shed is $3m$ long, calculate the volume of the shed.

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

c) It is given that $23m^2$ of the surface area of the shed need to be painted and that one tin of paint covers an area of $4{,}5m^2$.

Calculate the number of tins of paint that have to be bought to cover the $23m^2$.

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

d) **i)** Calculate the length of the edge DE.

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

ii) The sloping roof is to be covered by roofing material which costs \$6,40 per square metre.

Calculate the cost of roofing material needed to cover the sloping roof.

Answer (d)(ii) ..... **[3]**

12. **a)** It is given that $\mathbf{u} = \begin{pmatrix} 3 \\ 9 \end{pmatrix}$ and $\mathbf{v} = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$

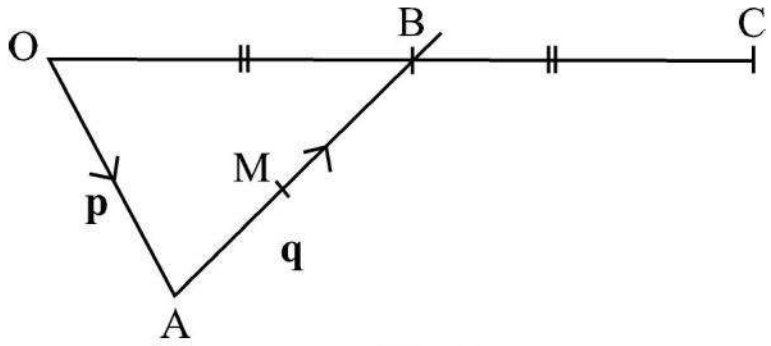
i) Simplify $\mathbf{u} - 3\mathbf{v}$.

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

ii) Evaluate $|\mathbf{u} - 3\mathbf{v}|$.

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

b)



In the diagram, $OA = \boldsymbol{p}$, $AB = \boldsymbol{q}$ and M is the midpoint of AB.

OB is produced to C such that OB = BC.

Express the following in terms of $\boldsymbol{p}$ and/ or $\boldsymbol{q}$,

i) **OC,**

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

ii) **OM,**

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

iii) **AC.**

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

iv) OM is produced to a point T (not in the diagram) such that OT = k OM, where k is a constant.

Express **OT** in terms of k, $\boldsymbol{p}$ and $\boldsymbol{q}$.

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

v) If point T is on AC and is such that AT = h AC, form and simplify another expression for **OT** in terms of h, $\boldsymbol{p}$ and $\boldsymbol{q}$.

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

vi) Using your answers in (iv), and (v), find the value of h and the value of k.

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

vii) Hence, find the ratio of MT : OT.

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

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4004/1

PAPER 1

NOVEMBER 2019 SESSION 2 hours 30 minutes

Candidates answer on the question paper

Additional materials:
Mathematical 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.

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.
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 to three significant figures 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.

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

1. Express

a) $2460\ cm^3$ in litres,

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

b) 1 hectare as a percentage of $0{,}25\ km^2$.

Answer(b) ..... [2]

2. **a)** Evaluate $(-8)^{\frac{2}{3}}$.

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

b) Simplify $\sqrt{147}+\sqrt{108}$. Leave the answer in the form $m\sqrt{n}$ where m and n are integers.

Answer(b) ..... [2]

3. Solve the simultaneous equations:

$$3x - y = 2$$
$$5x - 2y = 0$$

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

4. It is given that $q = -6$, $r = -1$ and $t = 2$.
Evaluate

a) $\dfrac{q\,r}{t}$.

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

b) $q\,t - r$.

Answer(b) ..... [1]

c) $(q + r)^t$.

Answer(c) ..... [1]

5. **a)** State the order of rotational symmetry of a rhombus.

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

.....

b) Four of the interior angles of a 12 sided polygon are each x°.
The other angles are $2x^\circ$ each.
Calculate the value of x.

Answer(b) ..... [2]

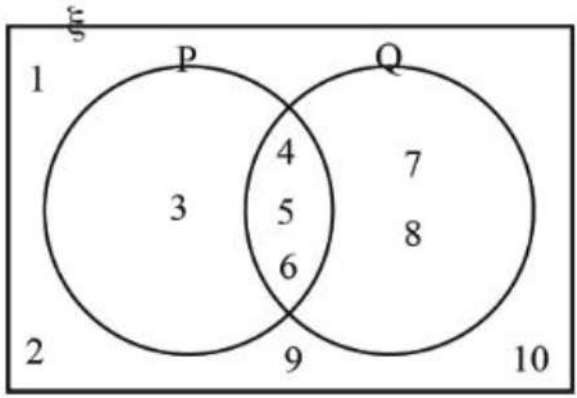
6. **a)** Calculate $\frac{2}{3}$ of 54 km.

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

b) Kin, Munashe and Chipo shared sweets in the ratio 5: 3 : 7.
Calculate the total number of sweets shared if Chipo got 35 sweets.

Answer(b) ..... [2]

7. a)



The Venn diagram consists of the universal set ξ, and subsets **P** and **Q** with their respective elements.

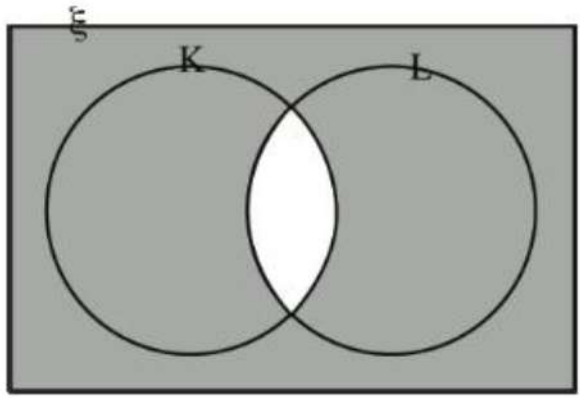
i) List the element of $P' \cap Q$.

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

ii) Find $n(P \cup Q)'$.

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

b)



The Venn diagram consists of the universal ξ, and subset **K** and **L**.
Describe the shaded region in set notation.

Answer(b) ..... [1]

8. Factorise completely

a) $x^2 - \frac{1}{4}$.

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

b) $x(x-2) - 2xy + 4y$.

Answer(b) ..... [2]

9. **a)** Express 2214_5 in powers of 5.

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

b) Find n given that $101_n = 37_{10}$.

Answer(b) ..... [2]

10. **a)** **P** is a 2×3 matrix, **Q** is a 3×1 matrix and **PQ** = **H**.
State the order of matrix **H**.

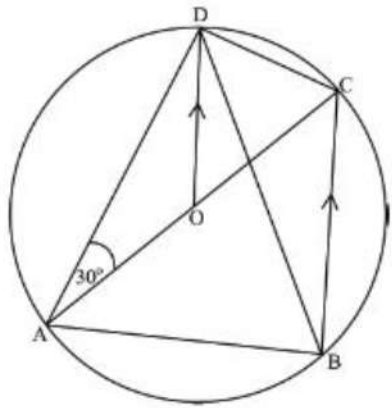
Answer(a) ..... [1]

b) Matrix $A = \begin{pmatrix} 2 & 1 \\ 3 & -3 \end{pmatrix}$

Find A^2.

Answer(b) ..... [2]

11.



In the diagram, points **A, B, C** and **D** are on the circumference of a circle centre **O.**
AOC is a straight line, **OD** is parallel to **BC** and **DÂO** = 30°.
Calculate

a) $O\hat{D}B$.

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

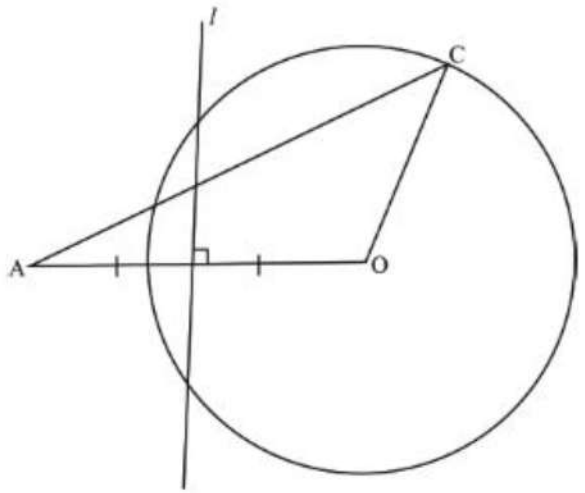
b) $A\hat{B}D$.

Answer(b) ..... [1]

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

Answer(c) ..... [1]

12.



The diagram shows triangle **AOC** and a circle with centre **O**, **OC** = 4cm and line, l, is the perpendicular bisector of **AO**.

a) Describe fully the locus represented on the diagram by the

i) circle,
Answer (a)(i) .....
.....
..... [1]

ii) line l.
Answer (a)(ii) .....
.....
..... [1]

b) **P** is both inside the circle and inside triangle **AOC** but nearer to **A** than **O**.
Show by shading in the diagram the region in which **P** must lie.

Answer (b) On the diagram ..... [1]

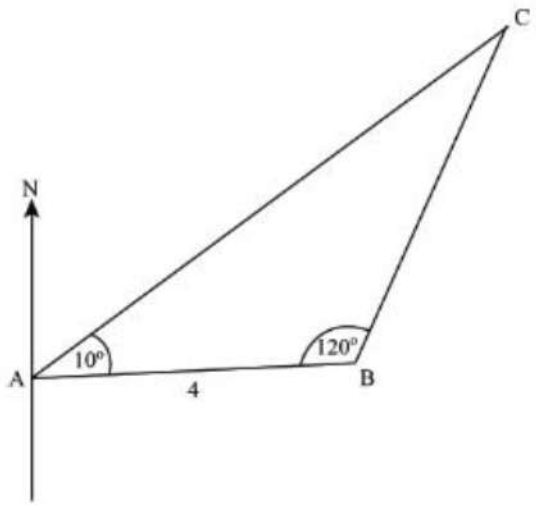
13. a) Convert US $5,40 to South African Rands.
Use an exchange rate of US $1 to 12 Rands.

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

b) A farmer borrowed $2000 at a simple interest rate of 20% per annum.
Calculate the total amount payable after 2 years.

Answer(b) ..... [3]

14.



In the diagram **A, B** and **C** are points on level ground.
Point **B** is 4km due east of **A**. $B\hat{A}C = 10°$ and $A\hat{B}C = 120°$

a) State the bearing of **B** from **C**.

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

b) Using as much of the information given below as is necessary to calculate **BC**.

[sin 10° = 0,2 cos 10° = 1,0 tan 10° = 0,2]

[sin 50° = 0,8 cos 50° = 0,6 tan 50° = 1,2]

Answer(b) ..... [3]

15. **a)** Evaluate $log_3 \frac{1}{243}$

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

b) Solve the equation $\text{Log}_3 81 = (2x - 1)$.

Answer(b) ..... [2]

16.

h	1	2	3	...	q
V	3	24	81	...	648

The table shows some corresponding values of h and V such that $V \propto h^3$.
Find the

a) equation connecting V and h,

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

b) value of q.

Answer(b) ..... [2]

17. Point A (4; 2) is mapped onto A_1, by a transformation represented by matrix $\begin{pmatrix} 1 & 0 \\ -3 & 1 \end{pmatrix}$.

a) Calculate the coordinates of point A_1.

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

b) Describe fully the transformation represented by the matrix

$\begin{pmatrix} 1 & 0 \\ -3 & 1 \end{pmatrix}$.

Answer(b) .....

.....

..... [3]

18. **a)** Solve the inequality

$$3x - 6 \leq 2x - 3 < 4x + 1.$$

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

b) Illustrate the solution in (a) on a number line.

Answer(b)

..... [1]

19. It is given that $g = \sqrt{\frac{h-4}{5+h}}$.

a) Find g when $h = 20$.

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

b) Express h in terms of g.

Answer(b) ..... [3]

20. It is given that $\boldsymbol{OA} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$ and $\boldsymbol{OB} = \begin{pmatrix} 4 \\ 1 \end{pmatrix}$ are position vectors of **A** and **B** relative to an origin **O**.

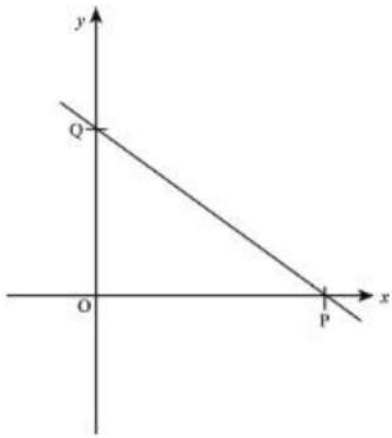
a) Express **AB** in column form.

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

b) **P** is a point such that **BP = OA + 2OB**.
Find the coordinates of point **P.**

Answer(b) ..... [3]

21.



The diagram shows the straight line $3x + 4y = 12$ which cuts the x–axis at **P** and y–axis at **Q**.

a) State the coordinates of point

i) **P**.

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

ii) **Q**.

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

b) Calculate the

i) gradient of line $3x + 4y = 12$.

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

ii) length of line **PQ**.

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

22.

Height (h cm)	$20 < h \leq 30$	$30 < h \leq 40$	$40 < h \leq 50$	$50 < h \leq 60$	$60 < h \leq 70$
Number of plants	4	6	10	2	8

The table shows the heights of 30 plants in a school garden.

a) **i)** State the modal class height.

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

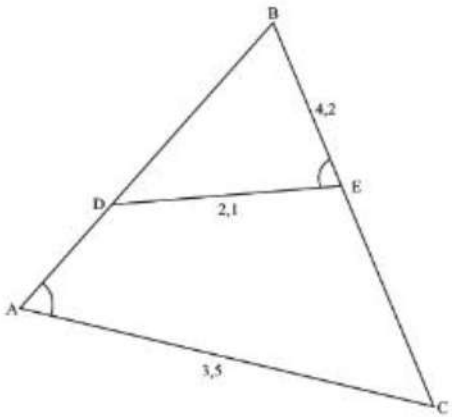
ii) Estimate the mean height of the plants.

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

b) A plant is chosen at random from the garden.
Find the probability that its height is more than 40cm but less or equal to 60cm.

Answer(b) ..... [1]

23.



The diagram shows triangle **ABC** in which point **D** and **E** are on **BA** and **BC** respectively **AC** = 3,5cm, **BE** = 4, 2cm, **DE** = 2,1cm and $B\hat{A}C = B\hat{E}D$.

a) Name the triangle which is similar to triangle **ABC**.

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

b) Calculate

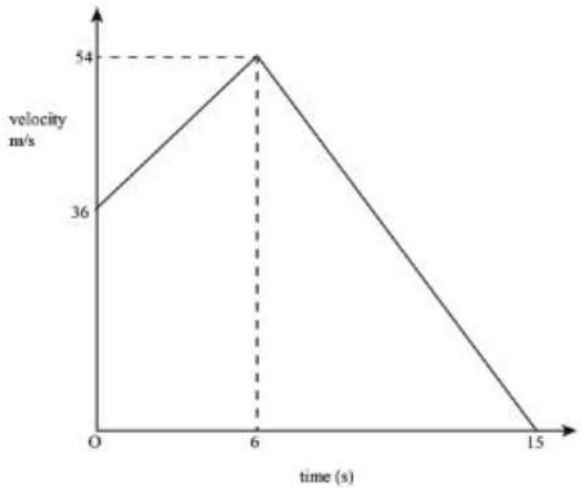
i) **AB,**

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

ii) the area of triangle ABC, given that the area of triangle **BDE** is $22,5cm^2$.

Answer (b)(ii) ..... [3]

24.



The diagram shows the velocity-time graph of a moving object which accelerates uniformly from 36 **m/s** to a velocity of 54 **m/s** in 6 seconds. It then retards uniformly to rest in a further 9 seconds.

Calculate the

a) acceleration during the first 6 seconds,

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

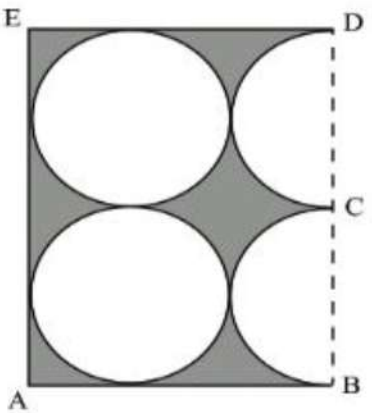
b) velocity after 10 seconds,

Answer(b) ..... [2]

c) average speed of the object for the 15 seconds.

Answer(c) ..... [3]

25



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

Two identical circular and 2 semi-circular discs of radii 3.5 cm were cut off from a rectangular sheet of metal as shown in the diagram.

AE = 14cm and **ED** = 10.5cm.
Calculate the

a) circumference of one of the circular discs,

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

b) perimeter of **ABCDE**,

Answer(b) ..... [2]

c) area of the shaded part.

Answer(c) ..... [3]

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4004/2

PAPER 2

NOVEMBER 2019 SESSION 2 hours 30 minutes

Candidates answer on the question paper
Additional materials:
Mathematical instruments
Mathematical tables
Electronic Calculator
Graph paper (if needed)

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.
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** questions from Section B.
Write your answers in the spaces provided on the question paper using **black** or **blue** pens.
If working is needed in 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.
Decimal 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 Electronic calculators may be used to evaluate explicit numerical expressions

SECTION A (52 Marks)

Answer **all** questions in this section

1. **a)** Simplify

$$4 - \left(1\frac{3}{4} + 1\frac{2}{3}\right).$$

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

b) $y = 5,3$ and $z = 4,2$, to 1 decimal place.

Find the minimum possible value of .

Give the answer correct to 2 decimal places.

Answer(b) ..... [2]

c) A hotel has Executive and General rooms in the ratio 3:5 respectively.

A General room costs $19,00 per day.

On a certain day, all the 2928 rooms were occupied by both Executive and General customers.

The total takings from the rooms was $66 612,00.

i) Find the number of General rooms in the hotel.

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

ii) Calculate the cost per day of an Executive room.

Answer (c)(ii) ..... [3]

2. **a)** Matrix A = $\begin{pmatrix} x+2 & 4 \\ 3 & 3 \end{pmatrix}$.

The determinant of matrix A is less than 7.

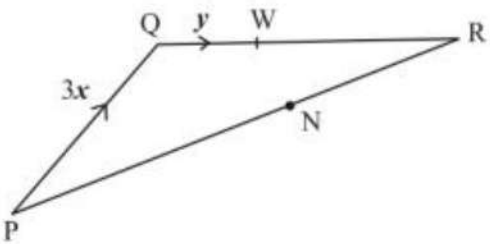
i) Find the largest integer value of .

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

ii) What is the inverse of matrix A using the value of x above.

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

b)



In the diagram $\overrightarrow{PQ} = 3x$ and $\overrightarrow{QW} = y$.

N is a point on **PR** to make **PN** = 2**NR**.
QW is produced to R to make **QW : WR** = 1:5.

Express in terms of x and y.

i) $\overrightarrow{QR}$,

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

ii) $\overrightarrow{PR}$,

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

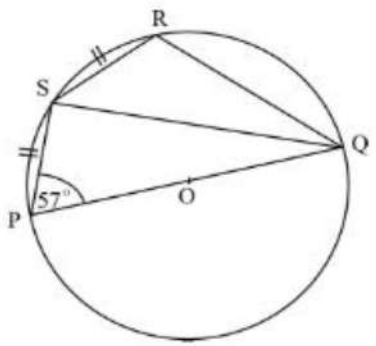
iii) $\overrightarrow{PN}$.

Answer(b)(iii) ..... [1]

iv) $\overrightarrow{QN}$

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

3. a)



In the diagram above, P, Q, R and S are points on the circumference of a circle centre O.
POQ is a diameter of the circle.
Arcs PS and SR are equal.
$\hat{QPS} = 57°$

i) Name the angle which is equal to $S\hat{Q}R$.

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

ii) Find $P\hat{Q}S$.

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

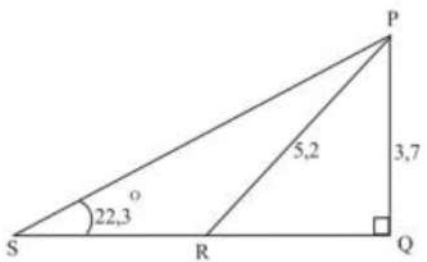
iii) Find $Q\hat{R}S$.

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

iv) Find $Q\hat{S}R$.

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

b)



In the diagram above , triangle PQS is right-angled at Q.
SRQ is a straight line.
PQ = 3,7 cm, PR = 5,2 cm and $P\hat{S}R = 22,3°$.

i) Calculate PS.

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

ii) Calculate $Q\hat{P}R$.

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

iii) Calculate $S\hat{P}R$.

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

4. **a)** A sweet shop sells cylindrical sweets each of diameter 3,8 cm and length 4,9 cm.

In this question take π to be $3\frac{1}{7}$

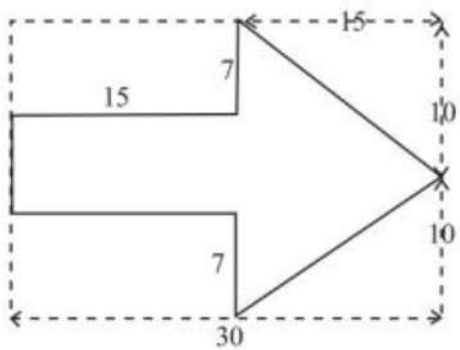
i) Calculate the volume of one sweet.

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

ii) The mass of 1 cm^3 of the sweet is 0,63g,
Calculate the mass of one sweet.
Give the answer to the nearest gramme.

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

b)



The diagram above is an arrow for a signpost. The arrow is cut from a rectangular sheet of metal with dimensions 30 cm by 20 cm.

i) Calculate the area of the arrow.

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

ii) Calculate the perimeter of the arrow.

Answer (b)(ii) ..... [4]

5. **Answer the whole of this question on the space below**
Use ruler and compasses only for all constructions and show all construction lines and arcs
All constructions should be done in a single diagram

ABCD is a trapezium in which AB = 6, 5 cm, AD= 5, 2 cm and $A\hat{B}C = 120°$.
AD is perpendicular to AB.
DC is parallel to AB.

a) **i)** Construct the trapezium ABCD .

On diagram ..... [6]

ii) Construct the bisector of $A\hat{B}C$.

On diagram ..... [2]

b) Describe the locus of points that the bisector of $A\hat{B}C$ represents.

Answer(b) .....
..... [2]

c) Measure and write down the length of BC.

Answer(c) ..... [1]

SECTION B (48 Marks)

Answer **any four** questions from this section

Each question carries **12** marks

6. **a)** Solve the equation below

$$3^{k} = \frac{81^{2} \times 3^{5}}{3^{11}}$$

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

b) **i)** Factorise completely

$6y^2 - 10y + 4$.

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

ii) Factorise completely $ax + b + a + bx$.

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

c) Express $\frac{6}{2x-x^2} - \frac{3}{x}$ as a single fraction in its simplest form.

Answer(c) ..... [3]

d) **i)** $p \propto t^{-3}$ *and* $p = 4$ *when* $t = 2$.
Find a formula connecting p and t.

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

ii) $p \propto t^{-3}$ *and* $p = 4$ *when* $t = 2$.
Find the value of t when $p = \frac{1}{2}$.

Answer (d)(ii) ..... [1]

7. **a)** During a sale, all prices were reduced by 15%.
A jacket that was bought for $55.
Calculate the original price of the jacket.

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

b) An extract from MS Neto's bank statement for the month of May is shown below

DATE	Details	CR	DR	BALANCE
01.05.17	Balance Brought Forward			$10-00
29.05.17	Salary	$402-00		$412-00
30.05.17	Bank charges of 1% on Current Account Balance		X	Y
31.05.17	Withdrawal		Z	$292-88

i) Calculate the value of X,

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

ii) Calculate the value of Y.

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

iii) Calculate the value of Z.

Answer (b)(iii) ..... [1]

c) Omega decides to invest her pension of $600.

OPTION A: She can invest it in a bank that offers 4% per year **Simple** Interest.

OPTION B: She can invest it in a money market fund that offers 4% per year **Compound** Interest.

i) Calculate Omega's interest under Option A at the end of 3 years,

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

ii) Calculate Omega's interest under Option B at the end of 3 years.

Answer (c)(ii) ..... [3]

iii) Calculate the difference between the amounts of interest from the two options.

Answer (c)(iii) ..... [1]

8. **a)** $A = \dfrac{h(12+b)}{2}$.

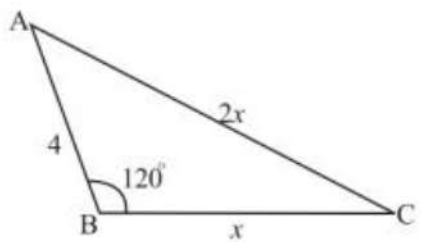
i) Find the value of A when b = 1.5 and h = 0.8.

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

ii) Express h in terms of A.

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

b)



In the diagram above ABC is a triangle.

$AB = 4\ cm,\ AC = 2x cm,\ BC = x\ cm\ and\ A\hat{B}C = 120°.$

i) Form an equation in .

Show that it reduces to $3x^2 - 4x - 16 = 0$.

Answer (b)(i)

..... [3]

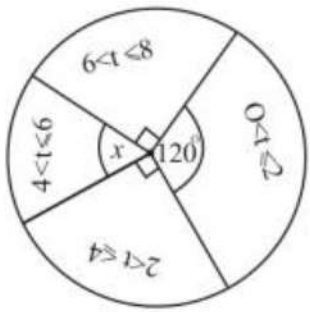
ii) Solve the equation $3x^2 - 4x + 16 = 0$.

Leave the answers correct to 3 significant figures.

Answer (b)(ii) .....

..... [5]

9.



The pie chart above represents the time, t, hours spent by 240 people on charity work.

a) Find the value of x.

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

.....

b) The following table below shows the information contained in the pie chart.

time (t hours)	$0<t\leq 2$	$2<t\leq 4$	$4<t\leq 6$	$6<t\leq 8$
Frequency	80	p	q	r

i) Find the value of p.

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

.....

ii) Find the value of q.

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

iii) Find the value of r.

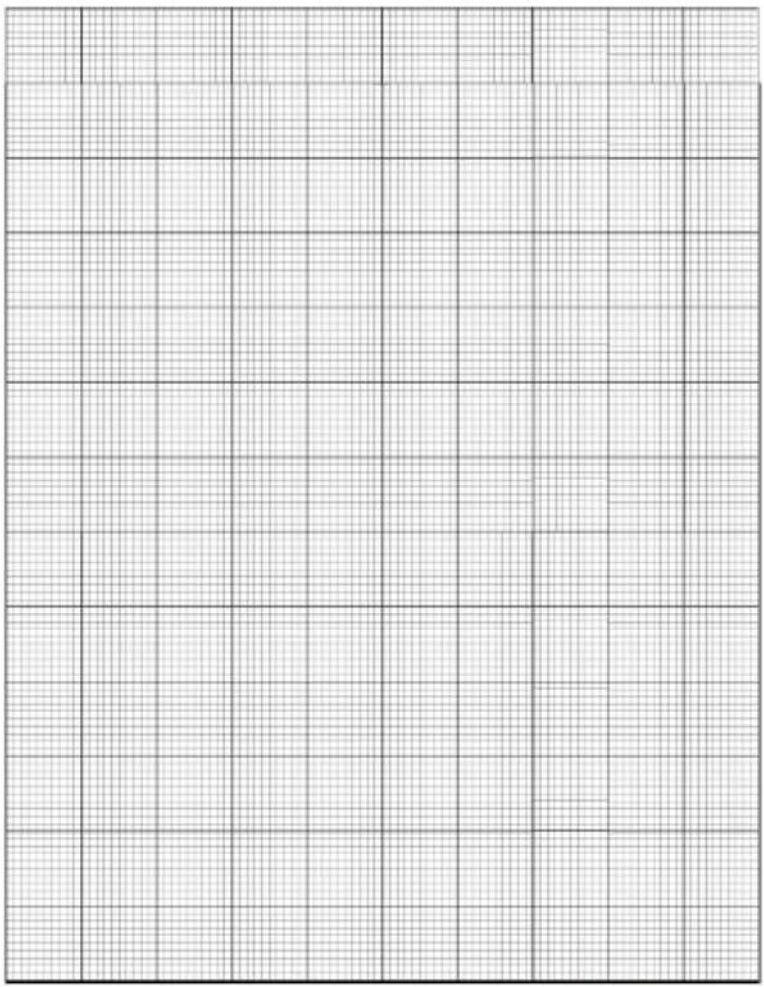
Answer (b)(iii) ..... [1]

c) Calculate an estimate of the mean time spent on charity work.

Answer(c) ..... [3]

d) Draw a frequency polygon to show the information on the grid on page 24.

Use a scale of 2 cm to 2 units on the x axis and 2 cm to 10 units on the y axis



Answer (d) On the diagram ..... [3]

e) Two people chosen at random from the whole group.
Find the probability that they both spent more than 4 hours doing charity work.

Answer(e) ..... [2]

10. The table below shows values for the function $f(x) = x^3 - 4x^2 + 4$.

x	-1	-0.5	0	0,5	1	1,5	2	2,5	3	3.25	4
$f(x)$	-1	2,9	4	3,1	1	$-1,6$	-4	$-5,4$	p	$-2,1$	4

a) Find the value of p.

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

b) Draw the graph of $f(x) = x^3 - 4x^2 + 4$ on the grid below on page 26.
Use a scale of 2 cm to 1 unit on both axes.

Answer (b) on graph ..... [4]

c) i) Use the graph to find the coordinates of the minimum turning point of the graph.

Answer (c)(i) ..... [1]

ii) Use the graph to solve the equation $x^3 - 4x^2 + 4 = 0$

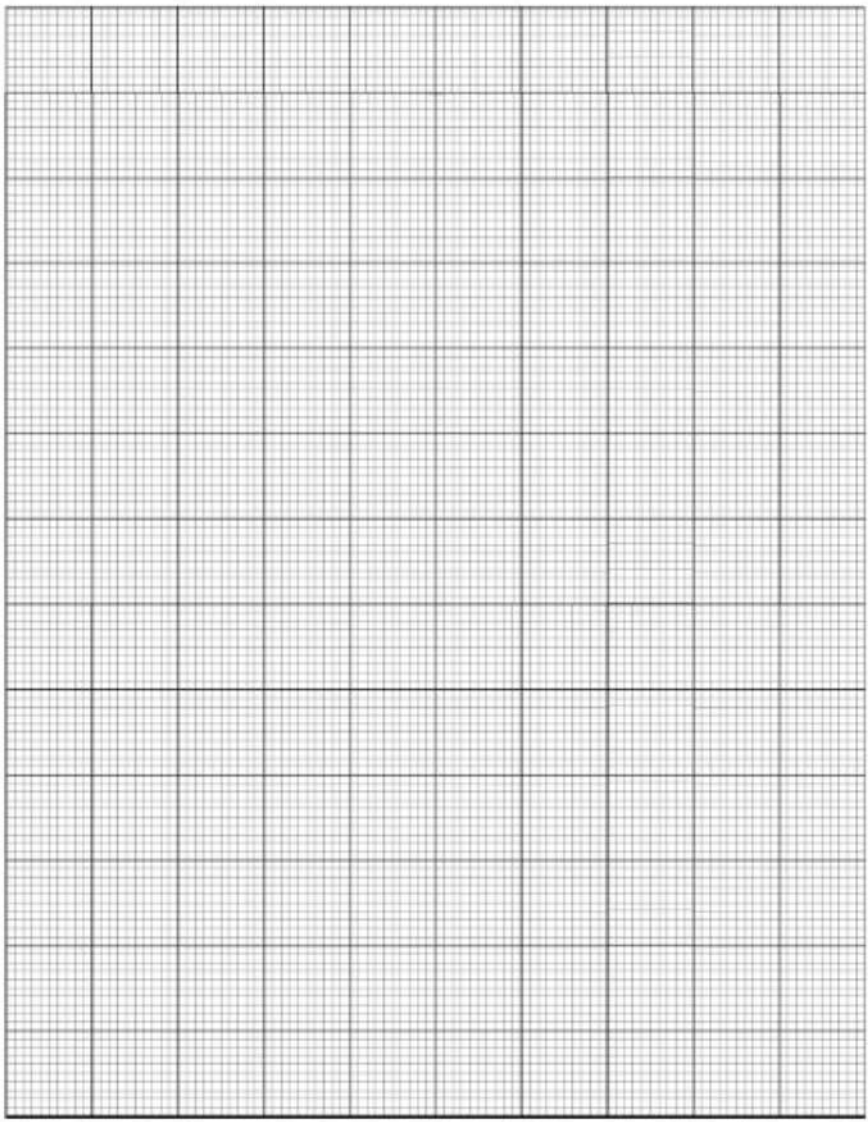
Answer (c)(ii) .....
.....
..... [3]

iii) Use the graph to find the area bound by the graph, x-axis, and the lines $x = 2$ and $x = 3$.

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

iv) Use the graph to find the range of values of x for which $f(x)<-4$.

Answer (c)(iv) ..... [1]



11. **a)** A school's agriculture department plants beans and peas in its 5 hectare field.

x is the area in hectares required for beans and y is the area in hectares under peas.

Write down an inequality in x and y which satisfies this condition.

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

b) Beans require 2 bags of fertiliser per hectare and peas require 4 bags of fertilisers per hectare.

The department has 16 bags of fertiliser for the plants.

Write down another inequality in x and y.

Show that it reduces to $x + 2y \leq 8$.

Answer (b)

..... [2]

c) i) The department plants at least one hectare of beans.
Write down an inequality, in x that satisfies this condition.

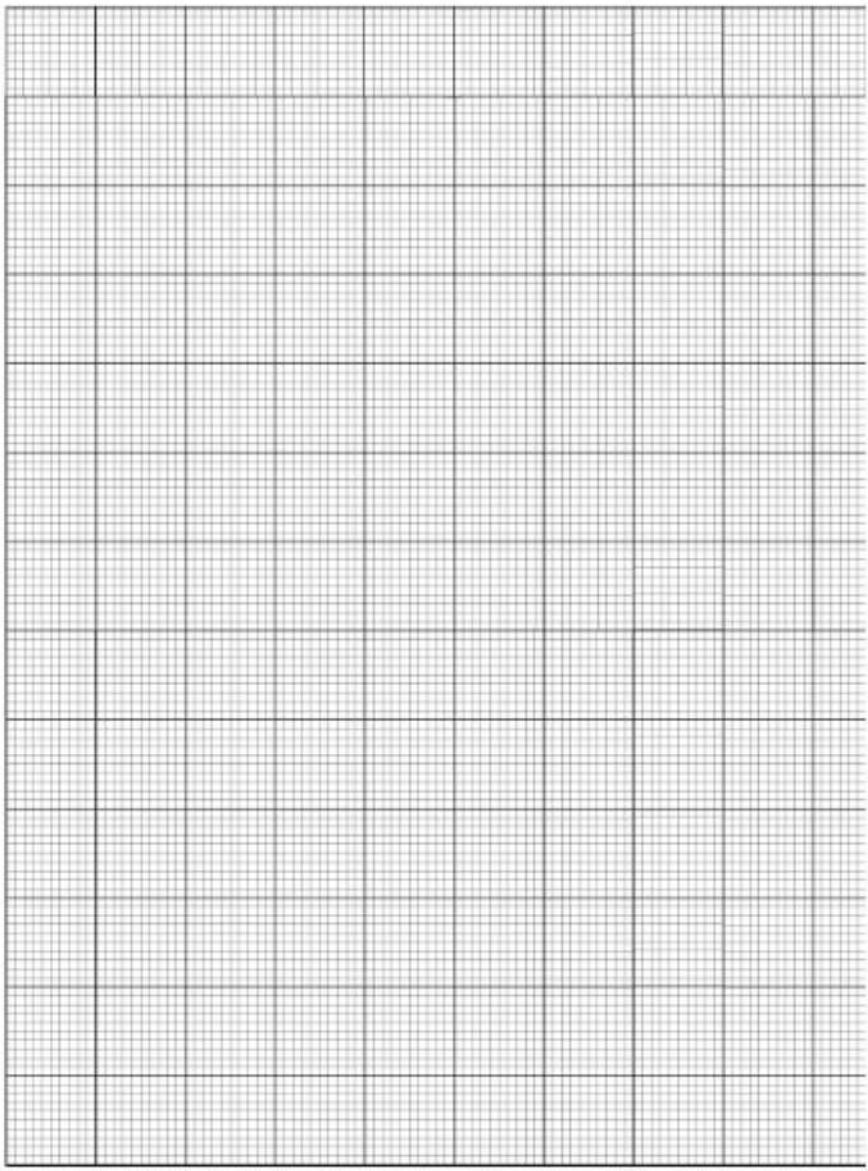
Answer (c)(i) ..... [1]

ii) The department plants at least one hectare of peas.
Write down an inequality in y, that satisfies this condition.

Answer (c)(ii) ..... [1]

d) Answer this part of the question on the grid on page 29..
Use a scale of 2 cm to 2 units on both axes.
The point $(x; y)$ represents x hectares and y hectares under beans and peas in that order
Show by drawing the inequalities in (a), (b), (c) and show by shading the **unwanted** regions, the region in which $(x; y)$ must lie.

Answer (d) On diagram ..... [4]



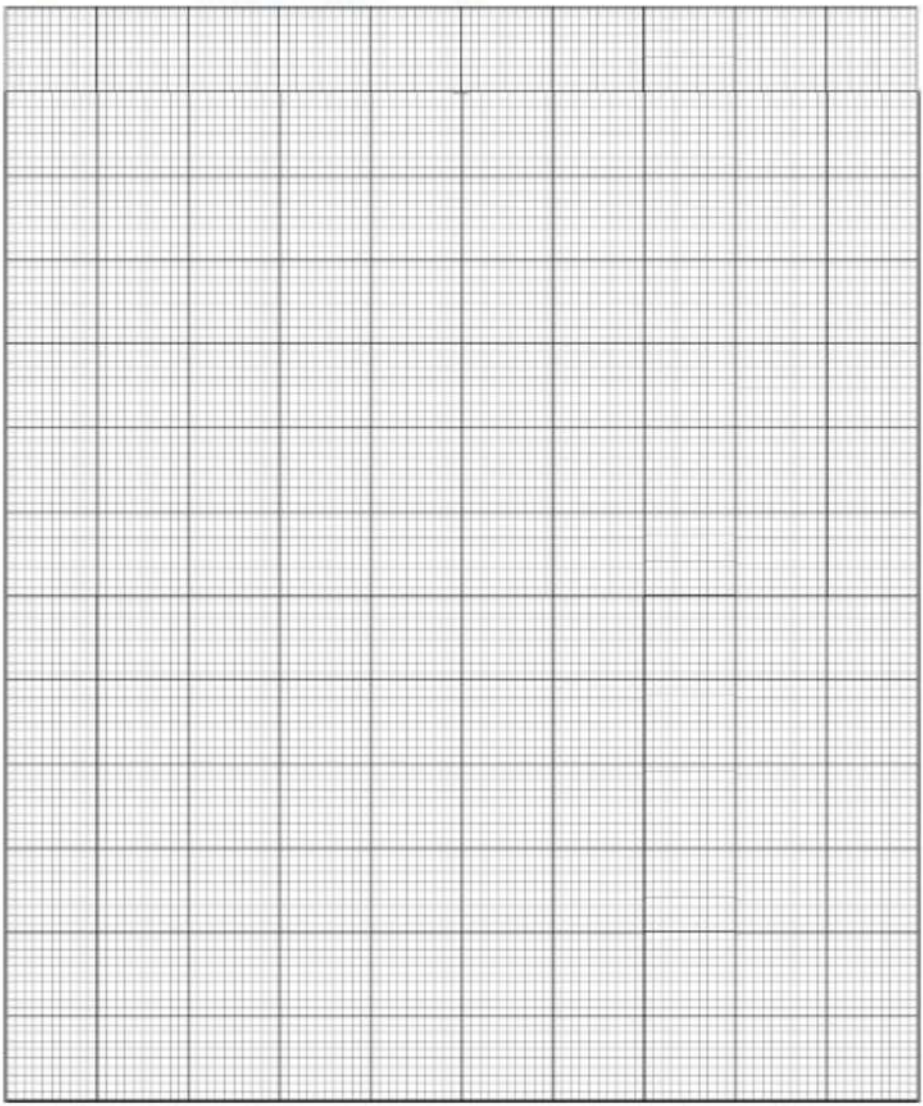
e) i) The profit is \$30, 00 per hectare for beans and \$40,00 per hectare for peas. Find the area of each crop to be planted for maximum profit to be realised.

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

ii) Find the expected maximum profit that may be realised.

Answer (e)(ii) ..... [1]

12. Answer some parts of this question on this grid below.



a scale of 2 cm to 2 units on both axes to draw the x and and y axes.

a) **i)** Triangle A has vertices at $(-5;\ 2)$, $(-2;\ 2)$ and $(-2;\ 4)$.
Draw and label triangle A.

Answer (a)(i) on the graph .... [1]

ii) Triangle B has vertices at $(2;\ 3)$, $(2;\ 0)$ and $(4;\ 0)$.
Draw and label triangle B.

Answer (a)(ii) on the graph .... [1]

b) Triangle C is the image of triangle B under an enlargement with centre $(2;\ -1)$ and enlargement factor of -1.5.
Draw and label triangle C.

Answer (b) on the graph ..... [3]

c) Point $(-2;\ 2)$ is translated onto $(6;\ -2)$.
Find the translation vector.

Answer(c) ..... [1]

d) Triangle D is the image of triangle A under a transformation represented by the matrix $\begin{pmatrix} 1 & 0 \\ -2 & 1 \end{pmatrix}$

Find the coordinates of the vertices of triangle D.

Answer(d) .....

.....

..... [3]

e) Describe fully the single transformation that maps triangle A onto triangle B.

Answer (c) .....

.....

..... [3]