Candidate Name | Centre Number | Candidate Number

0864820

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS 4008/1, 4028/1

PAPER 1

NOVEMBER 2006 SESSION 2 hours 30 minutes

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

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.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.
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 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.

FOR EXAMINER'S USE

This question paper consists of 27 printed pages and 1 blank page.

[Turn over

01079995

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

1 **(a)** From the set of natural numbers write down

(i) the first three prime numbers,

(ii) the first three square numbers.

(b) Express 980 as a product of its prime factors.

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

(ii) ______________________ [1]

(b) ______________________ [1]

For Examiner's Use

2 Find the exact value of

(a) $5 \times x^0$,

(b) $8^{-\frac{1}{3}}$,

(c) $\dfrac{6 \times 10}{6+4}$.

Answer *(a)* ______________________ [1]

(b) ______________________ [1]

(c) ______________________ [1]

[Turn over

3 Solve the equations

(a) $5^x = \frac{1}{25}$,

(b) $4y^2 = 9$.

Answer (a) $x =$ ____________________ [1]

(b) $y =$ __________ or __________ [2]

Exa

For Examiner's Use

4 Simplify as far as possible.

(a) $\frac{2p^2}{3q} \times \frac{9q^2}{8p^3}$,

(b) $3(6x-5)-2(4x-7)$.

Answer *(a)* ____________________ [1]

(b) ____________________ [2]

For Examiner's Use

5 Three brothers aged 36 years, 24 years and 18 years share $5,2 million in the ratio of their ages.

(a) Write down the ratio of their ages in descending order and in its simplest form.

(b) Calculate the youngest brother's share.

Answer *(a)*______________________ [1]

(b) $______________________ [2]

For Examin Use

5 Three brothers aged 36 years, 24 years and 18 years share \$5,2 million in the ratio of their ages.

(a) Write down the ratio of their ages in descending order and in its simplest form.

(b) Calculate the youngest brother's share.

Answer *(a)* ______________________ [1]

(b) \$ ______________________ [2]

For Examiner's Use

6 (a) Express 99,996 correct to 2 decimal places.

(b) Giving your answer in **base 8**, simplify $123_8 - 52_{10}$.

Answer(a) ______________________ [1]

(b) ______________________ [2]

7 For the numbers 10; 2; 9; 3; 9; 5, find

(a) the mode,

(b) the median,

(c) the mean.

Answer (a) ______________________________ [1]

(b) ______________________________ [1]

(c) ______________________________ [1]

For Examiner's Use

8 Simplify $\frac{-x^2-25}{x^2-2x-15}$.

Answer ______________________ [3]

9 Solve the simultaneous equations

$2x+2y=15$,

$0{,}3x-0{,}2y=3$.

Answer $x=$ ______________________

$y=$ ______________________ [3]

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For Examiner's Use

10 Make y the subject of the formula

$$m = \sqrt{\frac{1-y}{1+y}}.$$

Answer $y =$ ____________________ [3]

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11 **(a)** Given that $-5 \le x \le 5$, write down the least possible value of x^4.

(b) The actual distance between two towns is 240 km. On a map, the two towns are 30 cm apart.

Find the scale of the map in the form 1: n, where n is a whole number.

Answer (a) ____________________ [1]

(b) ____________________ [2]

13 **(a)** Given that $a^x = 36$ and $a^y = 4$, write down the numerical value of a^{x-y}

(b) Solve the inequality

$$8 \leq 3x - 7 < 19.$$

For Examiner's Use

Answer *(a)* ______________________ [1]

(b) ______________________ [2]

For Examiner's Use

14 Given that $\xi = \left\{-3;\ \sqrt{1\frac{1}{2}};\ \sqrt{36};\ \sqrt{13};\ \sqrt{6\frac{1}{4}};\ \sqrt{\frac{64}{16}}\right\}$,

Q' is the set of irrational numbers and Z is the set of integers, list the elements of

(a) Q',

(b) Z.

Answer *(a)* Q' = ______________________ [1]

(b) Z = ______________________ [2]

For Examiner's Use

15 In 2002 the cost of a new luxury car was \$254 million.

(a) Write down 254 million in figures only.

(b) Hence express \$254 million in standard form.

(c) If a company bought 8 such cars for its directors, calculate the amount, in billions of dollars, the company spent on the cars.

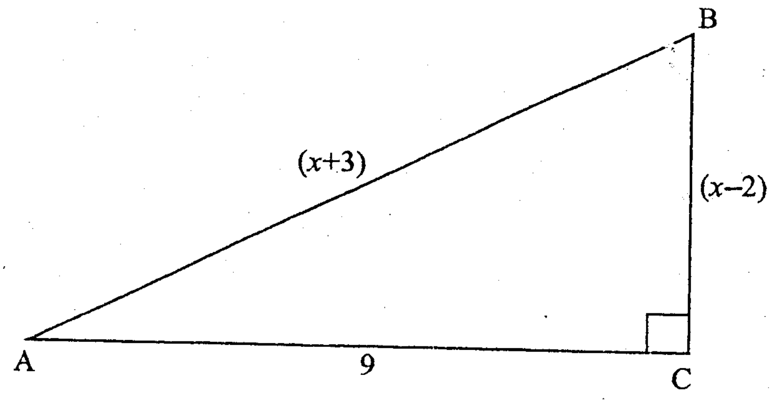
Answer *(a)* ____________________ [1]

(b) \$ ____________________ [1]

(c) \$ ______________ billion [2]

For Examiner's Use

16



In the diagram, AB = $(x+3)$ cm, BC = $(x-2)$ cm, AC = 9 cm and $A\hat{C}B = 90°$.

(a) Form an equation in x.

(b) Solve this equation.

(c) Hence write down the length of the hypotenuse.

Answer *(a)* ______________________ [1]

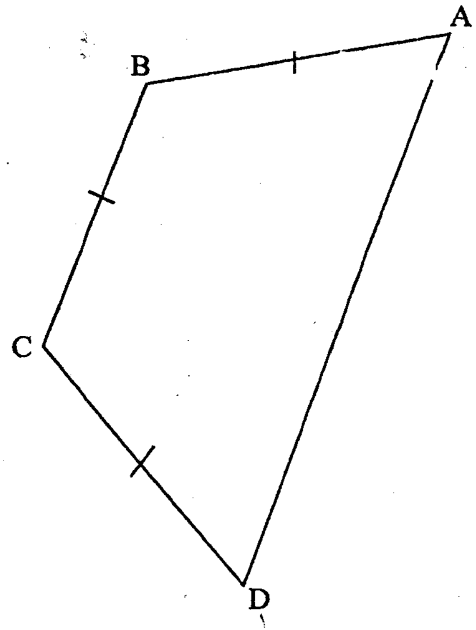
(b) $x =$ ______________________ [2]

(c) ______________________ cm [1]

[Turn over

For Examiner's Use

17



In the diagram, AB, BC and CD are three sides of a regular hexagon.

(a) Calculate

(i) $A\hat{B}C$,

(ii) $C\hat{D}A$.

(b) Draw the diagonals of quadrilateral ABCD and name the triangle which is congruent to triangle ABD.

Answer *(a) (i)* $A\hat{B}C =$ ______________________ [2]

(ii) $C\hat{D}A =$ ______________________ [1]

(b) ______________________ [1]

For Examiner's Use

18 It is given that $\mathbf{A}=\begin{pmatrix}2 & 3\\-4 & -2\end{pmatrix}$, $\mathbf{B}=\begin{pmatrix}-4\\y\end{pmatrix}$ and $\mathbf{C}=\begin{pmatrix}-14\\20\end{pmatrix}$.

Find **(a)** $\mathbf{A}^{-1}$,

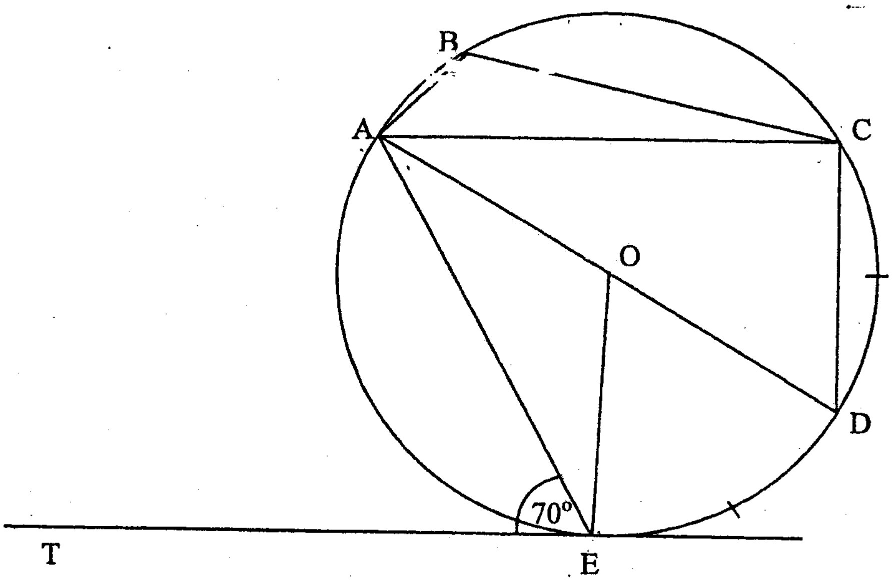
(b) the value of y such that $\mathbf{AB}=\mathbf{C}$.

Answer *(a)* $\mathbf{A}^{-1}=$ ____________________ [2]

(b) $y=$ ____________________ [2]

For Examiner Use

19



In the diagram, TE is a tangent to the circle centre O. AOD is a straight line, arc ED = arc DC and $T\hat{E}A = 70°$.

Calculate

(a) $E\hat{A}D$,

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

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

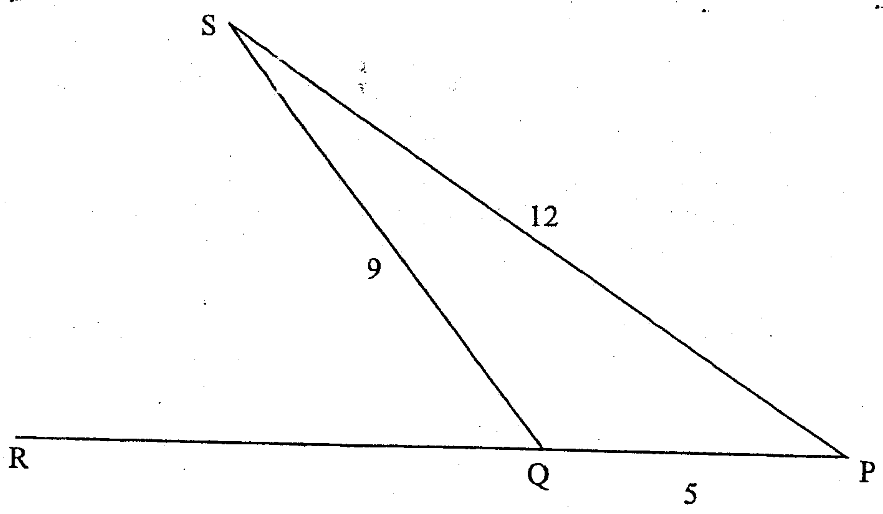
Answer *(a)* $E\hat{A}D$ = ____________________ [1]

(b) $C\hat{A}D$ = ____________________ [1]

(c) $A\hat{B}C$ = ____________________ [2]

For Examiner's Use

2?



In the diagram, PQR is a straight line, PQ = 5 cm, QS = 9 cm and PS = 12 cm. Giving your answer as a common fraction in its lowest terms, find

(a) $\cos P\hat{Q}S$,

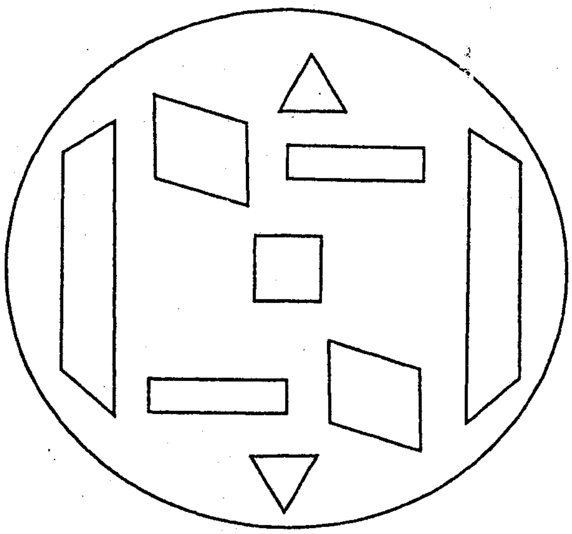
(b) $\cos R\hat{Q}S$.

Answer(a) $\cos P\hat{Q}S =$ ______________________ [3]

(b) $\cos R\hat{Q}S =$ ______________________ [1]

100

For Examiner' Use



The diagram shows a dartboard of total face area 1 200 cm^2. The targets are a square, two trapezia, two rectangles, two triangles and two rhombuses. Darts are thrown at the dartboard. If a target is hit the score is recorded. The table below gives more information about the targets on the dartboard.

TARGET	AREA OF EACH TARGET (cm^2)	SCORE PER TARGET
Triangle	45	10
Square	50	9
Rectangle	60	6
Rhombus	100	5
Trapezium	200	2

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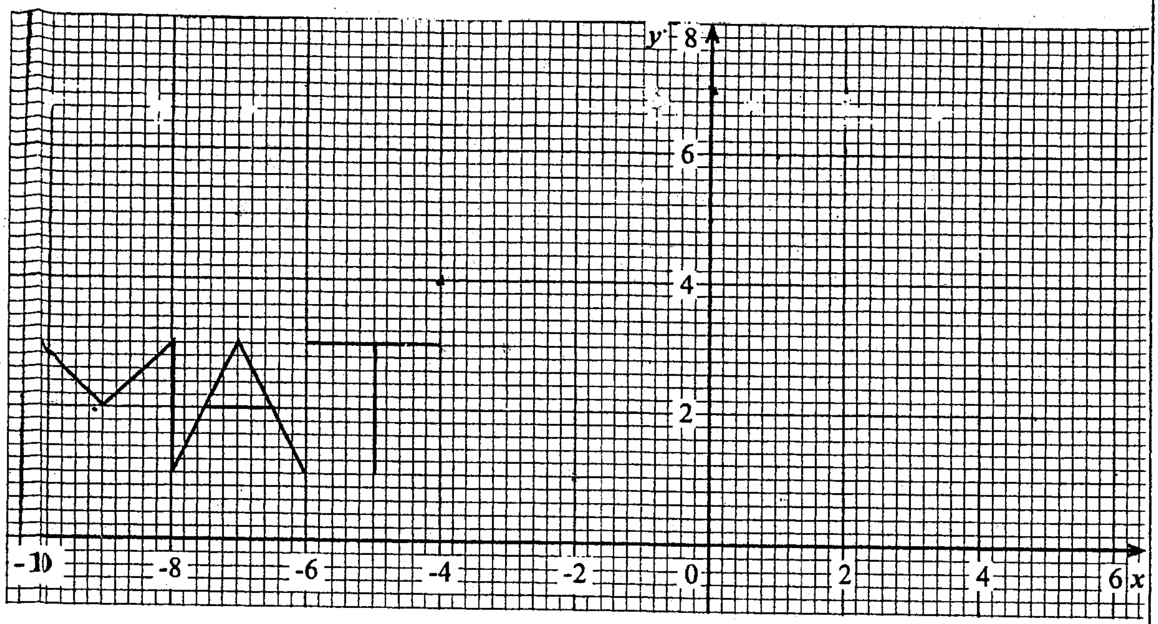


In the diagram, the word MAT is drawn on a Cartesian plane.

Draw accurately, on the same Cartesian plane, the following transformation:

(a) the reflection of the letter A in the line $y = 4$,

(b) the rotation of the letter M through 180° about the point (– 4; 4),

(c) the shear of the letter T with scale factor 3 and x–axis invariant.

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

(b) On diagram. [2]

(c) On diagram. [2]

Giving your answer as a common fraction, calculate the probability of

(a) scoring a 10 from one throw,

(b) an odd score from one throw,

(c) a total score of 7 from two throws.

Answer *(a)* ______________________ [1]

(b) ______________________ [1]

(c) ______________________ [2]

For Examiner's Use

103

For Examiner's Use

23 Given that V varies inversely as the square of t,

(a) express V in terms of t and a constant k,

(b) find

(i) the value of k given that $V = 25$ when $t = 2$,

(ii) the values of t when $V = \frac{1}{4}$.

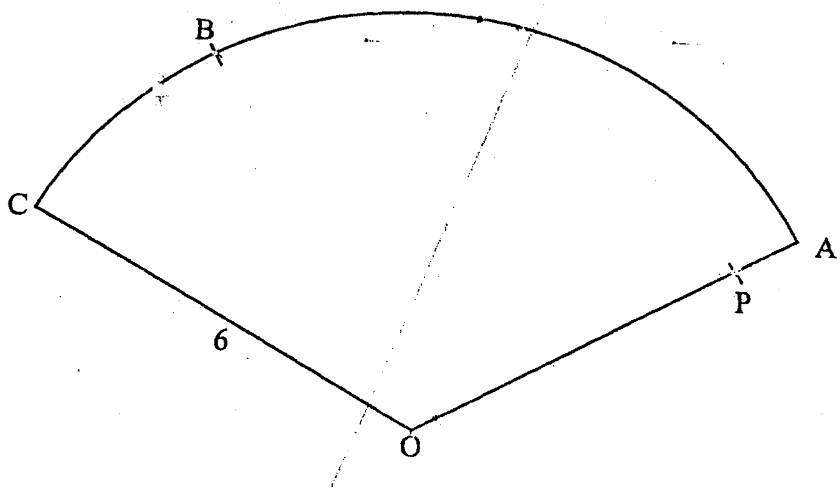
Answer *(a)* V = ______________________ [1]

(b) *(i)* $k =$ ______________________ [2]

(ii) $t =$ __________ or __________ [2]

| O.4

For Examiner Use



In the diagram, OABC is a 120° sector of a circle centre O and radius 6 cm.

(a) Using ruler and compasses only, construct, inside the sector,

(i) the locus of points equidistant from B and P,

(ii) the locus of points $4\frac{1}{2}$ cm from P.

(b) Shade the region inside the sector which contains points which are more than $4\frac{1}{2}$ cm from P and nearer to P than to B.

(c) Taking π to be 3,14, calculate the area of the sector OABC.

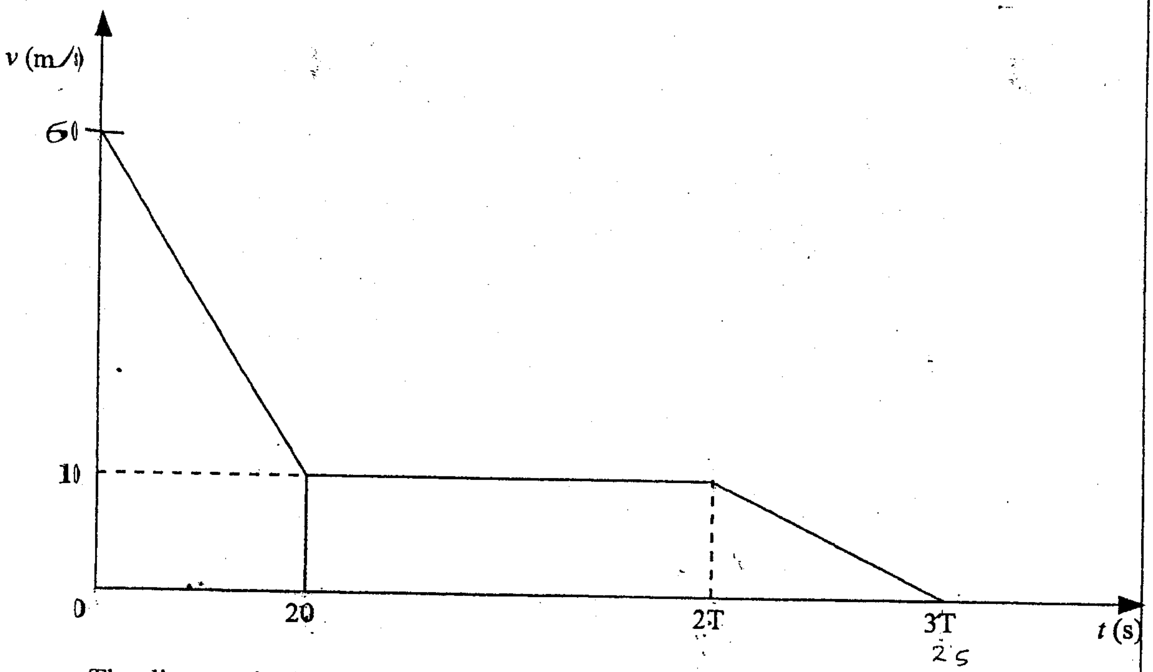
Answer *(a)* *(i)* On diagram. [2]

(ii) On diagram. [1]

(b) On diagram. [1]

(c) ______________ cm^2. [2]

25



The diagram is the velocity-time graph of the motion of an object. Given that the total distance travelled is 1,5 km, find

(a) the deceleration during the first 10 seconds,

(b) the value of T,

(c) the average velocity for the whole journey.

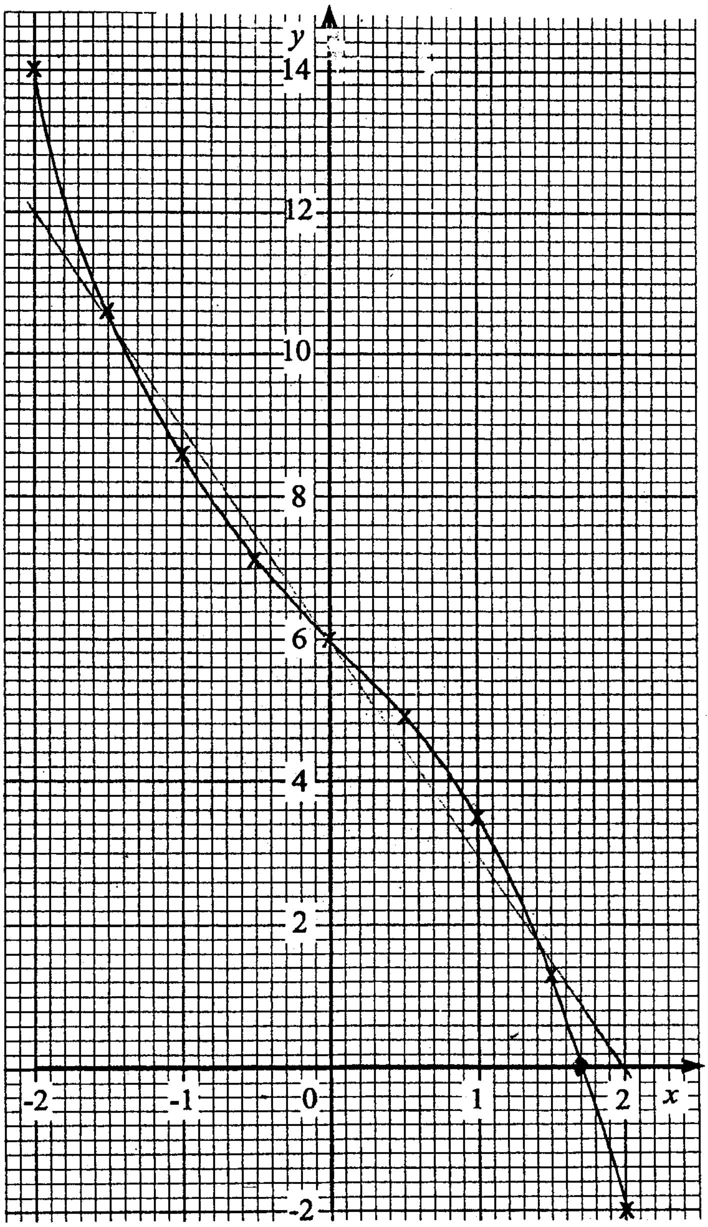
Answer (a) ______________ m/s^2 [1]

(b) T = ______________ [3]

(c) ______________ m/s [2]

For Examiner's Use

For Examiner Use



The diagram shows the graph of $y = 6 - 2x - \frac{1}{2}x^3$ for $-2 \le x \le 2$.

(a) Draw a straight line joining the points (2; 0) and (– 2; 12).

(b) Write down the equation of this line in the form $y = mx + c$.

For Examiner's Use

(c) Write down the x-values of the points of intersection of this line and the curve $y = 6 - 2x - \frac{1}{2}x^3$.

(d) Estimate the area bounded by the curve $y = 6 - 2x - \frac{1}{2}x^3$, the x-axis and the y-axis.

Answer (a) On diagram. [1]

(b) ________________________ [2]

(c) $x =$ ________ or ________ or ______ [3]

(d) ________________________ units^2 [2]

NOV 2006 PAPER 1

N = {1, 2, 3, 4, 5, 6, ...}

1(a) (i) 2, 3, 5

(ii) 1, 4, 9

(b)

2	980
2	490
5	245
7	49
7	7
	1

$980 = 2 \times 2 \times 5 \times 7 \times 7$

2 (a) $5 \times x^0 = 5 \times 1$

$= 5$

(b) $8^{-1/3} = \dfrac{1}{8^{1/3}}$

$= \dfrac{1}{\sqrt[3]{8}}$

$= 1/2$

(c) $\dfrac{6 \times 10}{6 + 4}$

$\dfrac{60}{10}$

$= 6$

3 (a) $5^x = 5^{-2}$

$x = -2$

(b) $\sqrt{4y^2} = \sqrt{9}$

$2y = \pm 3$

$2y = 3$ or $2y = -3$

$y = {}^3/_2$ or $y = -{}^3/_2$

4 (a) $\dfrac{2p^2}{3q} \times \dfrac{9q^2}{8p^3}$

$= \dfrac{18p^2q^2}{24qp^3}$

$= \tfrac{3}{4}p^{2-3}q^{2-1}$

$= \tfrac{3}{4}p^{-1}q^1$

$= \dfrac{3q}{4p}$

(b) $3(6x - 5) - 2(4x - 7)$

$18x - 15 - 8x + 14$

$18x - 8x - 15 + 14$

$10x - 1$

5(a) 36 : 24 : 18

6 : 4 : 3

(b) $\dfrac{3}{13} \times \$5\ 200\ 000$

$= \$1\ 200\ 000$

6 (a) 99,996

= 100,00

(b) $1\times8^2 + 2\times8 + 3\times8^0 - 52$

$83 - 52$

$= 31$

8	31	
8	3 r 7	⇧
	0 r 3	

$= 37_8$

7 (a) mode = 9

(b) median = 2, 3, $\underline{5, 9}$, 9, 10

$$= \frac{5+9}{2}$$

$$= \frac{14}{2}$$

$$= 7$$

(c) mean $= \dfrac{10+2+9+3+9+5}{6}$

$$= \frac{38}{6}$$

$$= 6\tfrac{1}{3}$$

8

$$\frac{x^2-25}{x^2-2x-15}$$

$$\frac{(x+5)(x-5)}{x^2+3x-5x-15}$$

$$\frac{(x+5)(x-5)}{x(x+3)-5(x+3)}$$

$$\frac{(x+5)(x-5)}{(x-5)(x+3)}$$

$$\frac{x+5}{x+3}$$

9 *(1)* $2x + 2y = 15$

(2) $0{,}3x + 0{,}2y = 3$

$$2x + 2y = 15$$
$$3x + 2y = 30$$
$$-x = -15$$
$$x = 15$$

$$2(15) + 2y = 15$$
$$30 + 2y = 15$$
$$2y = 15 - 30$$
$$\frac{2y}{2} = \frac{-15}{2}$$

$$y = -7{,}5$$

10 $m = \sqrt{\dfrac{1-y}{1+y}}$

$$m^2 = \frac{1-y}{1+y}$$

$$m^2(1+y) = 1-y$$
$$m^2 + m^2y = 1-y$$
$$m^2y + y = 1 - m^2$$
$$\frac{y(m^2+1)}{(m^2+1)} = \frac{1-m^2}{(m^2+1)}$$

$$y = \frac{1-m^2}{m^2+1}$$

11 (a) 0

(b) $30 : 240 \times 100\,000$

$30 : 24\,000\,000$

$1 : 800\,000$

12 (a) Bearing of Q from T $= 180° + 30°$

$= 210°$

(b) Area = ½base × height

$= \tfrac{1}{2} \times 20 \times 10\sqrt{3}$

$= 10 \times 10\sqrt{3}$

$= 100\sqrt{3}\ \text{km}^2$

13 (a) $a^x = 36$ and $a^y = 4$

$$a^{x-y} = \frac{a^x}{a^y}$$

$$= \frac{36}{4}$$

$$= 9$$

(b) $8 \leq 3x - 7$ $\quad$ $3x - 7 < 19$

$15 \leq 3x$ $\quad$ $3x < 19 + 7$

$5 \leq x$ $\quad$ $\frac{3x}{3} < \frac{26}{3}$

$x < 8^2/_3$

$5 \leq x < 8^2/_3$

14 (a) $Q' = \{\sqrt{13}\}$

(b) $Z = \{-3; \sqrt{36}\ ; \sqrt{^{64}/_{16}}\}$

15 (a) 254 000 000

(b) $\$2{,}54 \times 10^8$

(c) 254000000×8
$= 2032000000 \div 10^{12}$
$= \$0{,}002032$ billion

16 (a) $(x + 3)^2 = 9^2 + (x - 2)^2$

(b) $(x + 3)^2 = 9^2 + (x - 2)^2$

$(x + 3)(x + 3) = 81 + (x - 2)(x - 2)$

$x^2 + 3x + 3x + 9 = 81 + x^2 - 2x - 2x + 4$

$x^2 + 6x + 9 = 81 + x^2 - 4x + 4$

$x^2 + 6x + 9 = 85 + x^2 - 4x$

$x^2 - x^2 + 6x + 4x = 85 - 9$

$\frac{10x}{10} = \frac{76}{10}$

$x = 7{,}6$

(c) $7{,}6 + 3$

$= 10{,}6$ cm

17 (a) (i) $ABC = \frac{6 - 2(180)}{6}$

$= \frac{4(180)}{6}$

$= \frac{760}{6}$

$= 120°$

(ii) $C\check{D}A = \frac{360 - (120 \times 2)}{2}$

$= \frac{120}{2}$

$= 60$

(b) CAB is congruent to BDC

18 (a) A^{-1}, $A = \begin{bmatrix} 2 & 3 \\ -4 & -2 \end{bmatrix}$ det $= 2 \times -2 - -4 \times 3$ $= -4 + 12$ $= 8$ $\therefore A^{-1} = \frac{1}{8}\begin{bmatrix} -2 & -3 \\ 4 & +2 \end{bmatrix}$	**(b)** $AB = C$ $\begin{bmatrix} 2 & 3 \\ -4 & -2 \end{bmatrix}\begin{bmatrix} -4 \\ y \end{bmatrix} = \begin{bmatrix} -14 \\ 20 \end{bmatrix}$ $\begin{bmatrix} -8 + 3y \\ 16 + 2y \end{bmatrix} = \begin{bmatrix} -14 \\ 20 \end{bmatrix}$ $-8 + 3y = -14$ or $16 - 2y = 20$ $3y = -14 + 8$ or $-2y = 20 - 16$ $\frac{3y}{3} = \frac{-6}{3}$ $\frac{-2y}{-2} = \frac{4}{-2}$ $y = -2$ $y = -2$
19 (a) $E\hat{A}D = 20°$ **(b)** $C\hat{A}D = 20°$ **(c)** $ABC = 110°$	
20 (a) $\cos PQS = \frac{5^2 + 9^2 - 12^2}{2 \times 5 \times 9}$ $= \frac{25 + 81 + 144}{90}$ $= -\frac{19}{45}$	**(b)** $\cos RQS = -\left(-{}^{19}/_{45}\right)$ $= \frac{19}{45}$
21 (a) P(scoring a 10) $= \frac{45 \times 2}{1200}$ $= \frac{90}{1200}$ $= \frac{3}{40}$	**(b)** P(odd score) $= \frac{50 + 100 \times 2}{1200}$ $= \frac{250}{1200}$ $= \frac{5}{24}$
(c) P (2 , 5) or (5 , 2) $\frac{2 \times 200}{1200} \times \frac{2 \times 100}{1200}$ or $\frac{2 \times 100}{1200} \times \frac{2 \times 200}{1200}$ $\frac{1}{18} + \frac{1}{18}$ $= \frac{2}{18}$ $= \frac{1}{9}$	

23 (a) $V = \dfrac{k}{t^2}$

(b) $25 = \dfrac{k}{2^2}$

$100 = k$

(b) (ii) $\dfrac{1}{4} = \dfrac{100}{t^2}$

$t^2 = 400$

$t = \sqrt{400}$
$= 20 \text{ or } -20$

24 (c) $\dfrac{120}{360} \times 3{,}14 \times 6^2$

$= 37{,}68 \text{ cm}^2$

25 (a) $\dfrac{50}{20}$

$= 2{,}5 \text{ m/s}^2$

25 (b) $\tfrac{1}{2}\times(10+60)\times20+2T-20\times10+3T-2T\times10 = 1{,}5\text{km}$

$700 + 20T - 200 + 30T - 20T = 1500$

$500 + 30T = 1500$

$30T = 1500 - 500$

$\dfrac{30T}{30} = \dfrac{1000}{30}$

$T = 33\tfrac{1}{3}$

(c) Time taken $= \dfrac{100}{3} \times 3$
$= 100\text{s}$

Average speed $= \dfrac{1\ 500}{100}$

$= 15\text{m/s}$

26 (b) $y = mx + c$
m: gradient
c: where the line cuts the y-axis

gradient $= \dfrac{6}{-2}$

$= -3$

$\therefore y = -3x + 6$

(c) $x = 1{,}4$ or $-1{,}5$

(d) Area $= 306 \times \tfrac{1}{25}\ \text{cm}^2$
$= 12{,}24 \text{ cm}^2$

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ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS

4008/2

PAPER 2

NOVEMBER 2006 SESSION

2 hours 30 minutes

Additional materials:

Answer paper
Geometrical instruments
Graph paper (3 sheets)
Mathematical tables
Plain paper (1 sheet)

TIME 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces provided on the answer paper/answer booklet.

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

Write your answers on the separate answer paper provided.
If you use more than one sheet of paper, fasten the sheets together.

Electronic calculators must not be used.

All working must be clearly shown. It should be done on the same sheet as the rest of the answer.
Omission of essential working will result in loss of marks.
If the degree of accuracy is not specified in the question and if the answer is not exact, the answer should be given to three significant figures. Answers in degrees should be given 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 may be used to evaluate explicit numerical expressions.

This question paper consists of 13 printed pages and 3 blank pages.

[Turn over

140

Section A: [64 marks]

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

1 **(a)** Evaluate $5\frac{1}{4} - 1\frac{2}{3} \times 2\frac{1}{10}$, giving your answer as a mixed number in its lowest terms. [3]

(b) Noma has $(4x - 3y)$ dollars and Rudo has $(5x - y)$ dollars. Find, in its simplest form, the amount of money

(i) they have altogether,

(ii) Rudo has more than Noma. [3]

(c) If $f(x) = x^3 - 3x^2 + kx - 4$, find k given that $f(3) = 11$. [2]

---

2 **(a)** Factorise completely

(i) $3mp + np - 6mq - 2nq$,

(ii) $16 - 9r^2$. [4]

(b) It is given that

$$A = \pi r\left(h^2 - r^2\right).$$

(i) Make h the subject of the formula.

(ii) Find the value of h when $A = 330$, $r = 7$ and $\pi = \frac{22}{7}$. [5]

14

3 **(a)** In a class of 40, every pupil studies at least one of the subjects Mathematics, Geography and Accounts.

4 pupils study Mathematics and Geography,
5 study Mathematics and Accounts.
7 study Geography and Accounts.
15 study Mathematics only,
13 study Geography only and
4 study Accounts only.

Find the number of pupils who study all the three subjects. [3]

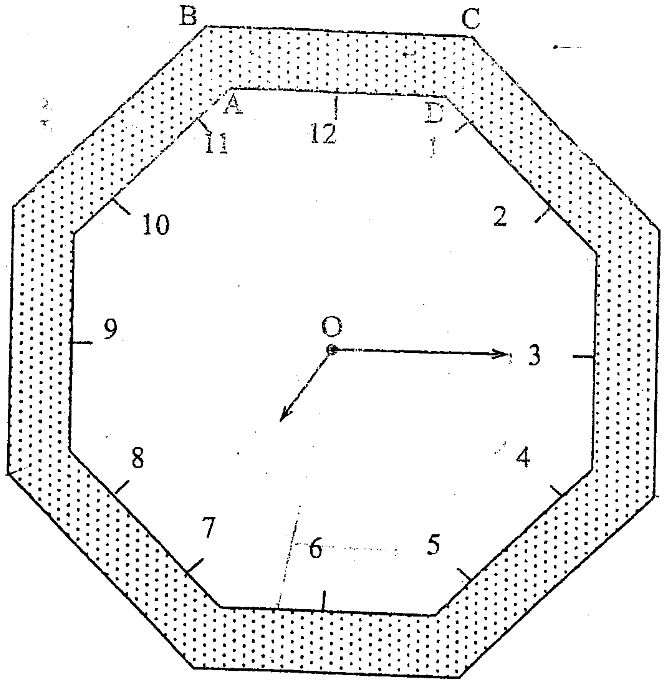
(b) Express $\frac{b}{a^2 - ab} + \frac{a}{b^2 - ab}$ as a single fraction in its lowest terms. [4]

(c) Solve the equation

$$\frac{1}{2-m} - \frac{3}{m-4} = 0.$$ [3]

[Turn over

1 42



Take π to be 3,142.

The diagram shows a clockface in the shape of two regular concentric octagons centre O. O, A and B are in a straight line, BO = 6 cm and AO = 5 cm. The area between the octagons is decorated.

(a) Determine the size of $A\hat{O}D$. [2]

(b) Calculate

(i) the area of ΔAOD,

(ii) the area of ΔBOC,

(iii) the area that is decorated. [5]

(c) Calculate the angle through which the minute hand turns in 18 minutes. [2]

(d) If the length of the minute hand is 4 cm, calculate the distance the tip of the minute hand moves in 18 minutes. [2]

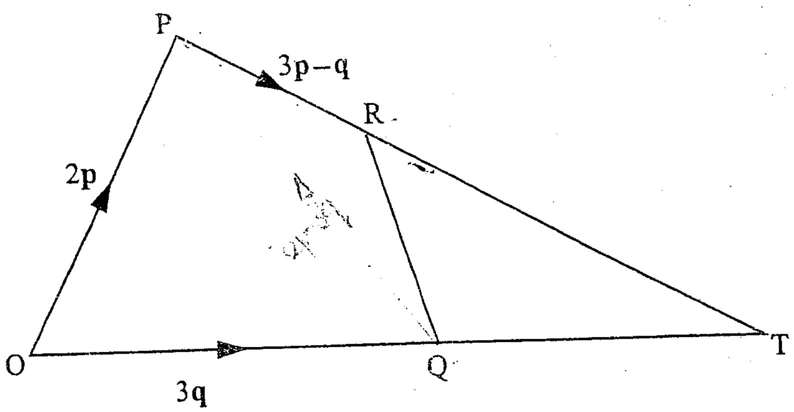
5 (a) Given that $\mathbf{M} = \begin{pmatrix} 4 & -9 \\ -2 & 5 \end{pmatrix}$, $\mathbf{N} = \begin{pmatrix} 1 & 3 \\ 0 & -1 \end{pmatrix}$ and $\mathbf{L} = \begin{pmatrix} 2d & 4 \\ 1 & 3 \end{pmatrix}$, find

(i) $\mathbf{M} + 2\mathbf{N}$,

(ii) $\mathbf{MN}$,

(iii) the value of d which makes matrix $\mathbf{L}$ singular. [6]

(b)



In the diagram, PRT and OQT are straight lines. $\overrightarrow{OP} = 2\mathbf{p}$, $\overrightarrow{OQ} = 3\mathbf{q}$ and $\overrightarrow{PR} = 3\mathbf{p} - \mathbf{q}$.

(i) Express $\overrightarrow{RQ}$ as simply as possible in terms of $\mathbf{p}$ and/or $\mathbf{q}$. [2]

(ii) Given that $PT = mPR$, express $\overrightarrow{PT}$ in terms of $\mathbf{p}$, $\mathbf{q}$ and m. [1]

(iii) Given also that $OT = nOQ$ form an equation connecting $\mathbf{p}$, $\mathbf{q}$, m and n. Hence find the value of m and the value of n. [4]

6 **Answer the whole of this question on a sheet of plain paper.**

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

(a) Construct a quadrilateral ABCD in which AB = 4 cm, BC = 6 cm, CD = 5 cm, $A\hat{B}C = 135°$ and $B\hat{C}D = 120°$. [6]

(b) Measure and write down

(i) the length of AD,

(ii) $B\hat{A}D$. [2]

(c) Construct the locus of points

(i) equidistant from AB and BC,

(ii) 3 cm from BC and on the same side of BC as A,

(iii) 4 cm from B. [5]

Section B: [36 marks]

Answer any three questions from this section.

7 (a) Solve the equation

$$2x^2 + 6x + 1 = 0,$$

giving your answers to 2 decimal places. [5]

(b) A geographical globe has a diameter of 48 cm. A miniature model of the globe has a diameter of 8 cm.

(i) Calculate the surface area of the model.

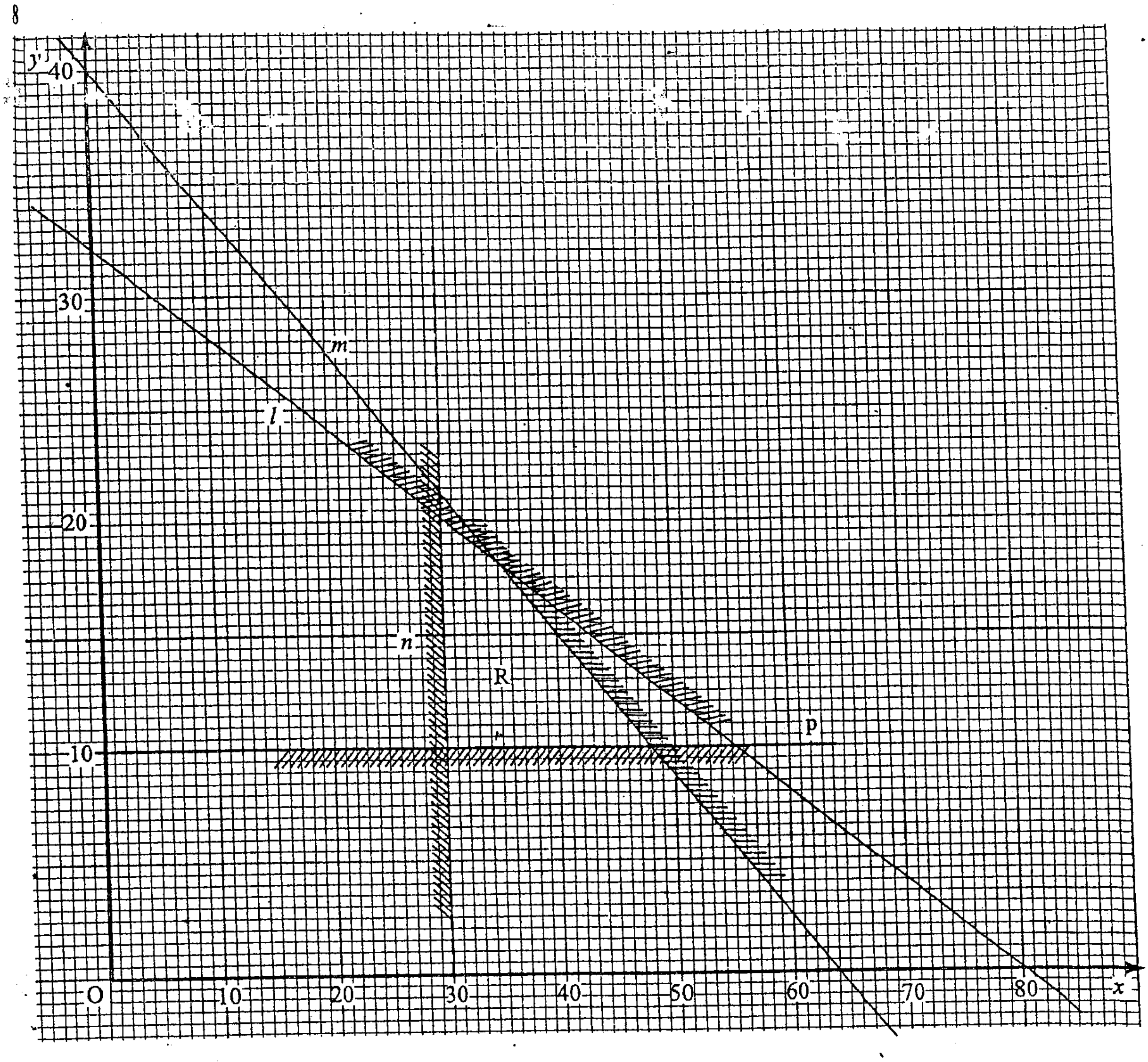
(ii) On the globe, the map of Zimbabwe occupies an area of 23,04 cm^2. Calculate the corresponding area on the model. [4]

(c) If the globes are solid, calculate the volume of the model. [3]

Volume of a sphere $= \frac{4}{3}\pi r^3$

Surface area of a sphere $= 4\pi r^2$

Take π **to be 3,142**



(a) In the diagram, R is the region bounded by lines m, n, l and p.

State the vertical scale. [1]

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(b) Use the region R to answer the following questions.

(i) Write down 3 inequalities other than $y \le -\frac{2}{5}x + 32$ which define R.

(ii) State the maximum value of y.

(iii) Given that $(x; y)$ is a point inside the region R and that x and y are integers, write down the value of x and the value of y which make $(x + y)$ a maximum.

(iv) Find the maximum value of $40x + 20y$. [11]

---

9 ***Answer the whole of this question on a sheet of graph paper.***

The following is an incomplete table of values for the function $y = \frac{12}{x} - 1$.

x	1	2	3	4	5	6	7	8
y	11	5	3	2	p	1	0,7	q

(a) Calculate the value of p and the value of q. [2]

(b) Using a scale of 2 cm to represent 1 unit on the x-axis and 2 cm to represent 2 units on the y-axis, draw the graph of $y = \frac{12}{x} - 1$ for $1 \le x \le 8$. [4]

(c) Use the graph to estimate

(i) the gradient of the curve at $x = 2$,

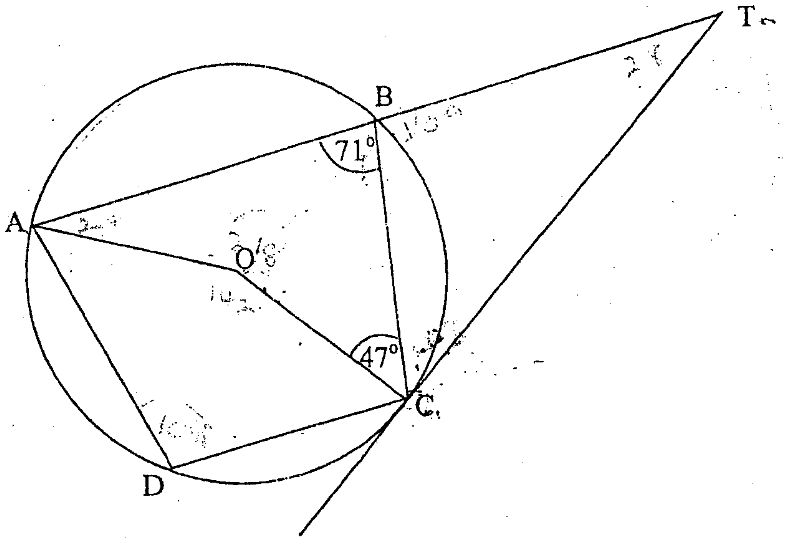
(ii) the area of the region between the curve, the x – axis and the lines $x = 3$ and $x = 6$. [4]

(d) On the same axes, draw the graph of $y = x + 4$.

Hence solve the equation $\frac{12}{x} - 1 = x + 4$. [2]

---

10 (a)



In the diagram, A, B, C and D are points on the circumference of a circle centre O. ABT is a straight line and CT is a tangent to the circle at C. $A\hat{B}C = 71°$ and $B\hat{C}O = 47°$.

Calculate

(i) reflex $A\hat{O}C$,

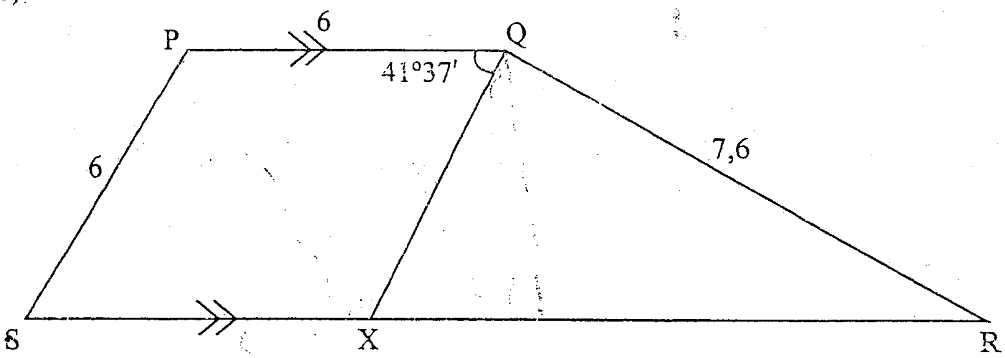
(ii) $C\hat{B}T$,

(iii) $B\hat{C}T$,

(iv) $B\hat{A}O$.

State why $A\hat{D}C = C\hat{B}T$. [5]

(b)



In the diagram, PQRS is a trapezium in which PQ is parallel to SR. X is a point on SR such that QX is parallel to PS. PQ = PS = 6 cm, QR = 7,6 cm and $P\hat{Q}X = 41°37'$.

Calculate

(i) the area of quadrilateral PQXS,

(ii) $Q\hat{R}X$. [7]

[Turn over

11 The electricity bills of a certain household for the months of December 2004 and January 2005 are shown below.

December 2004

Description	Previous Reading	Present Reading	Consumption	Rate (cents)	Total $ c
Balance b/f					3 150,99
Payment					3 151,00CR
Energy charge	31 565	31 834	269	m	1 894,57
Fixed monthly charge					530,49
Value Added Tax(VAT)					363,76
Amount Due					2 788,81

January 2005

Description	Previous Reading	Present Reading	Consumption	Rate (cents)	Total $ c
Balance b/f					2 788,81
Payment					5 000,00CR
Energy charge	31 834	32 331	n	1 909	9 496,84
Fixed monthly charge					1 067,69
Value Added Tax (VAT)					1 253,00
Amount due					q

(a) Find the values of m, n and q. [5]

(b) Calculate

(i) the rate at which Value Added Tax (VAT) was charged in December,

(ii) the percentage increase in the monthly fixed charge for the two months. [7]

11 **Answer the whole of this question on a sheet of graph paper.**

The table below shows the marks of 50 pupils in an entrance test marked out of 100.

Mark x	$20 < x \leq 30$	$30 < x \leq 45$	$45 < x \leq 50$	$50 < x \leq 60$	$60 < x \leq 70$	$70 < x \leq 80$	$80 < x \leq 100$
Frequency f	2	5	4	16	14	6	3

(a) State the modal class. [1]

(b) Calculate an estimate of the mean mark. [3]

(c) Find the value of m and the value of n in the frequency density table below. [2]

Mark x	$20 < x \leq 30$	$30 < x \leq 45$	$45 < x \leq 50$	$50 < x \leq 60$	$60 < x \leq 70$	$70 < x \leq 80$	$80 < x \leq 100$
Frequency	2	5	4	16	14	6	3
Frequency density	0,20	0,33	m	1,60	1,40	0,60	n

(d) Using a scale of 2 cm to represent 10 marks on the horizontal axis and 4 cm to represent 1 unit on the vertical axis, draw a histogram to represent this information. [4]

(e) Any mark above 50 was considered a pass. If two pupils were chosen at random, calculate the probability that both passed the test. [2]

NOVEMBER 2006 4008/2: EXPECTED ANSWERS

1(a) $5\frac{1}{4} - 1\frac{2}{3} \times 2\frac{1}{10}$

$$\frac{21}{4} - \frac{8}{3} \times \frac{21}{10}$$

$$\frac{21}{4} - \frac{7}{2}$$

$$\frac{21-14}{4}$$

$$= \frac{7}{4}$$

$$= 1\frac{3}{4}$$

(b) $4x - 3y + 5x - y$

$\underline{9x - 4y}$

c $5x - y - (4x - 3y)$

$5x - y - 4x + 3y$

$\underline{x + 2y}$

(c) $3^3 - 3(3)^2 + k(3) - 4 = 11$

$= 27 - 27 + 3k - 4 = 11$

$3k = 11 + 4$

$3k = 15$

$k = 5$

2(a) $3mp + np - 6mq - 2nq$

$p(3m + n) - 2q(3m + n)$

$(p - 2q)(3m + n)$

(b) $A = \pi r(h^2 - r^2)$

$$\frac{A}{\pi r} = h^2 - r^2$$

$$\frac{A}{\pi r} + r^2 = h^2$$

$$\sqrt{\frac{A}{\pi r} + r^2} = h$$

(c) $h = \sqrt{\frac{A}{\pi r} + r^2}$

$$= \sqrt{\frac{330}{\frac{22}{7} \times \frac{7}{1}} + 7^2}$$

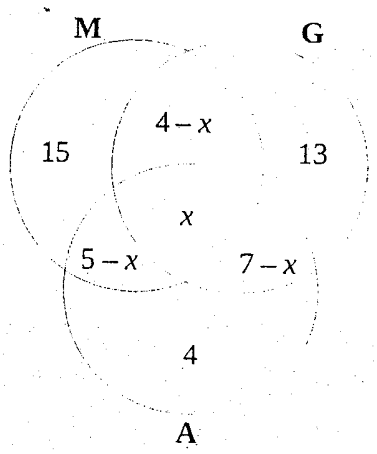
$$= \sqrt{\frac{330}{22} + 49}$$

$= \sqrt{(15+49)}$

$= \sqrt{64}$

$= 8$

3(a)



x study all the three

$15+4-x +x +5-x +7-x +13+4 = 40$

$48 - 2x = 40$

$48 - 40 = 2x$

$8 = 2x$

$4 = x$

$\therefore$ 4 study all the three

3(b) $\dfrac{b(b^2 - ab) + a(a^2 - ab)}{(a^2 - ab)(b^2 - ab)}$

$\dfrac{b^3 - ab^2 + a^3 - a^2b}{(a^2 - ab)(b^2 - ab)}$

$\dfrac{b^2(b - a) - a^2(-a + b)}{(a^2 - ab)(b^2 - ab)}$

$\dfrac{(b^2 - a^2)(b - a)}{(a^2 - ab)(b^2 - ab)}$

$\dfrac{(b^2 - a^2)(b - a)}{a^2(b^2 - ab) - ab(b^2 - ab)}$

$\dfrac{(b^2 - a^2)(b - a)}{a^2b^2 - a^3b - ab^3 + a^2b^2}$

$\dfrac{(b^2 - a^2)(b - a)}{a^2b(b - a) - ab^2(b - a)}$

$\dfrac{(b^2 - a^2)(b - a)}{(a^2b - ab^2)(b - a)}$

$\dfrac{b^2 - a^2}{-ab(-a+b)}$

$= \dfrac{(b + a)(b - a)}{-ab(-a + b)} \quad = -\dfrac{b + a}{ab}$

(c) Solve the equation

$\dfrac{1}{2 - m} - \dfrac{3}{m - 4} = 0$

$\dfrac{1}{2 - m} = \dfrac{3}{m - 4}$

$1(m - 4) = 3(2 - m)$

$m - 4 = 6 - 3m$

$\dfrac{4m}{4} = \dfrac{10}{4}$

$m = 2{,}5$

4(a) $A\hat{O}D = \frac{1}{8} \times 360$

$= 45°$

(b)(i) Area of $A\hat{O}D = \frac{1}{2}ab\sin\theta$

$= \frac{1}{2}\times 6\times 6\sin 45$

$= 12{,}728$

$= 12{,}7\text{cm}^2$

(ii) Area of BOC $= \frac{1}{2}ab\sin\theta$

$= \frac{1}{2}\times 7\times 7\sin 45$

$= 24{,}5\sin 45$

$= 17{,}324$

$= 17{,}3\text{cm}^2$

Area of decorated part

$= (\frac{1}{2}\times 7\times 7\sin 45 - \frac{1}{2}\times 6\times 6\sin 45)\times 8$

$= (17{,}324 - 12{,}728)8\text{cm}^2$

$= 4{,}596 \times 8\text{ cm}^2$

$= 36{,}768\text{cm}^2$

$= 36{,}8\text{cm}^2$

In 15minutes it turns 90°

.'. in one minute $\dfrac{90}{15}$

$= 6°$

In 18 minutes $= 18\times 6$

$= 108°$

(d) $\dfrac{\theta}{360} \times 2\pi r$

$= \dfrac{180}{360} \times 2 \times \dfrac{22}{7} \times 4$

$= 7\frac{19}{35}\text{cm}$

$= 7{,}54286$

$= 7{,}5\text{cm}$

5(a)(i) $\begin{pmatrix}4 & -9\\ -2 & 5\end{pmatrix} + 2\begin{pmatrix}1 & 3\\ 0 & -1\end{pmatrix}$

$\begin{pmatrix}4 & -9\\ -2 & 5\end{pmatrix} + \begin{pmatrix}2 & 6\\ 0 & -2\end{pmatrix}$

$= \begin{pmatrix}6 & -3\\ -2 & 3\end{pmatrix}$

(ii) $\begin{pmatrix}4 & -9\\ -2 & 5\end{pmatrix}\begin{pmatrix}1 & 3\\ 0 & -1\end{pmatrix}$

$\begin{pmatrix}4\times1 + -9\times0 & 4\times3 + -9\times-1\\ -2\times1 + 5\times0 & -2\times3 + 5\times-1\end{pmatrix}$

$= \begin{pmatrix}4 & 21\\ -2 & -11\end{pmatrix}$

(iii) $2d\times3 - 1\times4 = 0$

$6d - 4 = 0$

$\dfrac{6d}{6} = \dfrac{4}{6}$

$d = \tfrac{2}{3}$

5(b)(i) **RQ = RP + PO + OQ**

$= -3p+q-2p+3q$

$= 4q - 5p$

(ii) PT = m**PR**

$= m(3p - q)$

$= 3mp - mq$

(iii) OT = n**OQ**

$= n(3q)$

$= 3nq$

PT = OP + OT

$= -2p + 3nq$

$\therefore 3mp - mq = -2p + 3nq$

$\dfrac{3mp}{p} = \dfrac{-2p}{p}$

$3m = -2$

$m = -\tfrac{2}{3}$

$-mq = 3nq$

$-(-\tfrac{2}{3})q = 3nq$

$\dfrac{\tfrac{2}{3}q}{q} = \dfrac{3nq}{q}$

$\tfrac{2}{3} = 3n$

$n = \dfrac{2}{9}$

7(a) $2x^2 + 6x + 1 = 0$; a=2 b=6 c=1

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-6 \pm \sqrt{6^2 - 4\times2\times1}}{2\times2}$$

$$= \frac{-6 \pm \sqrt{36 - 8}}{4}$$

$$= \frac{-6 \pm \sqrt{28}}{4}$$

$$= \frac{-6 + 5,2915}{4} \quad \text{or} \quad \frac{-6 - 5,2915}{4}$$

$$= \frac{-0,708497}{4} \quad \text{or} \quad \frac{-11,92915}{4}$$

$x = -0,18$ or $-2,98$

(b)(i) Surface area $= 4\pi r^2$

$$= 4 \times \frac{22}{7} \times 4^2$$

$$= 201\tfrac{1}{7}\text{cm}^2$$

(ii) ratio of side = 8 : 48
= 1 : 6

ratio of area = $1^2 : 6^2$
= 1 : 36

$\therefore$ Area on the model $= \frac{23,04}{36}$

$= 0,64\text{cm}^2$

Volume $= \tfrac{4}{3}\pi r^3$

$$= \frac{4}{3} \times \frac{22}{7} \times 4^3$$

$$= 268\tfrac{4}{21}\text{cm}^3$$

8(a) 4cm to represent 10 units

(b)(i) $y \geq 10$; $x > 30$ and $y \leq -\tfrac{5}{8}x + 40$

(ii) Maximum value of $y = 20$

(iii) value of $x + y$ which make $(x+y)$ a maximum
$x = 40$
$y = 20$

(vi) $40x + 20y$

$= 40(40) + 20(20)$

$= 1600 + 400$

$= 2000$

10(a)(i) reflex $A\hat{O}C = 218°$ **(ii)** $CBT = 109°$ **(iii)** $BCT = 43°$ **(iv)** $B\hat{A}O = 24°$ Exterior angle of a cyclic quad = opposite interior angle	**(b)(i)** Area of PQXS $= 6 \times 6\sin 41{,}37°$ $= 23{,}909174cm^2$ $= 23{,}9cm^2$ **(ii)** $\sin 41°37' = \frac{h}{6}$ $h = 6\sin 41°37'$ $= 3{,}984862261$ XR => Pythagoras theorem $= \sqrt{6^2 - 3{,}984862261^2} + \sqrt{7{,}6^2 - 3{,}984862261^2}$ $= \sqrt{20{,}12087276} + \sqrt{41{,}88278266}$ $= 4{,}485629583 + 6{,}471690866$ $= 10{,}95732045$ Area of QRX = ½base×height $= \frac{1}{2} \times 10{,}95732045 \times 9{,}98486226$ $= 23{,}83148908cm^2$ $= 21{,}83cm^2$
11 $m = \frac{1894{,}57}{269}$ cents per unit $= 7{,}0430$ $= 7{,}043$c per unit $h = 32\ 331 - 31\ 834$ $= 497$ $q = 5000{,}00 - 2788{,}81$ $= 2211{,}19$ $+ 9496{,}86$ $11708{,}05$ $1067{,}69$ $12775{,}74$ $1253{,}00$ $14028{,}74$	**(b)(i)** $\frac{363{,}76}{1894{,}57} \times \frac{100}{1}$ $= 19{,}2\%$ **(ii)** Increase $= 1067{,}69 - 530{,}49$ $= 537{,}2$ $\therefore \frac{537{,}2}{530{,}49} \times \frac{100}{1}$ $= 101{,}2648683\%$ $= 101{,}3\%$

6 b(i) AD = 11,3 cm
BÂD = 52°

NOV 2006

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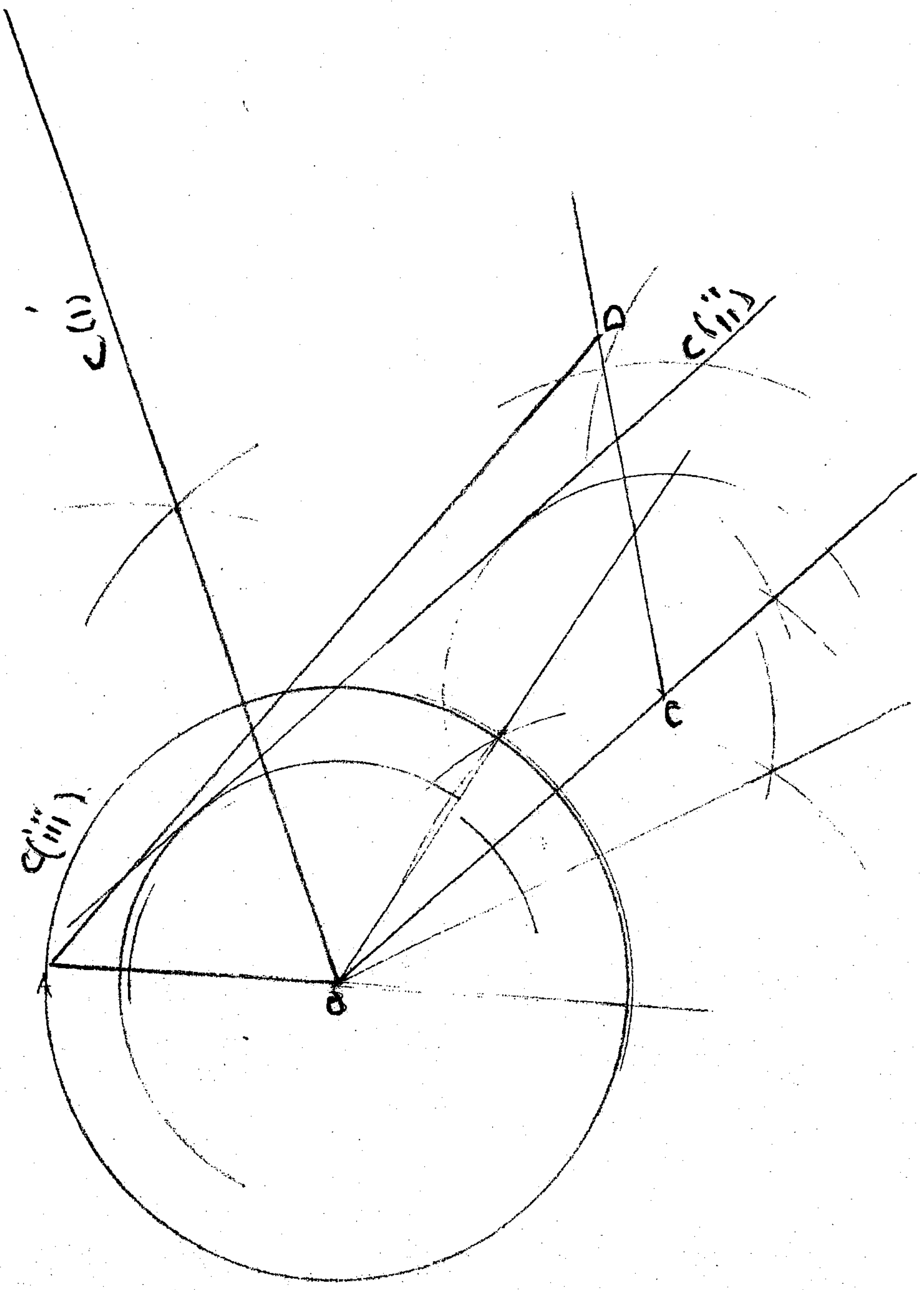


NOV 2006

Candidate Name ....

Subject .... Paper ....

Question No 9   158

Centre Number	Candidate's Number

9(a) $p = 1,4$ $q = 0,5$

c(i) gradient $= -\frac{6}{2}$

$= -3$

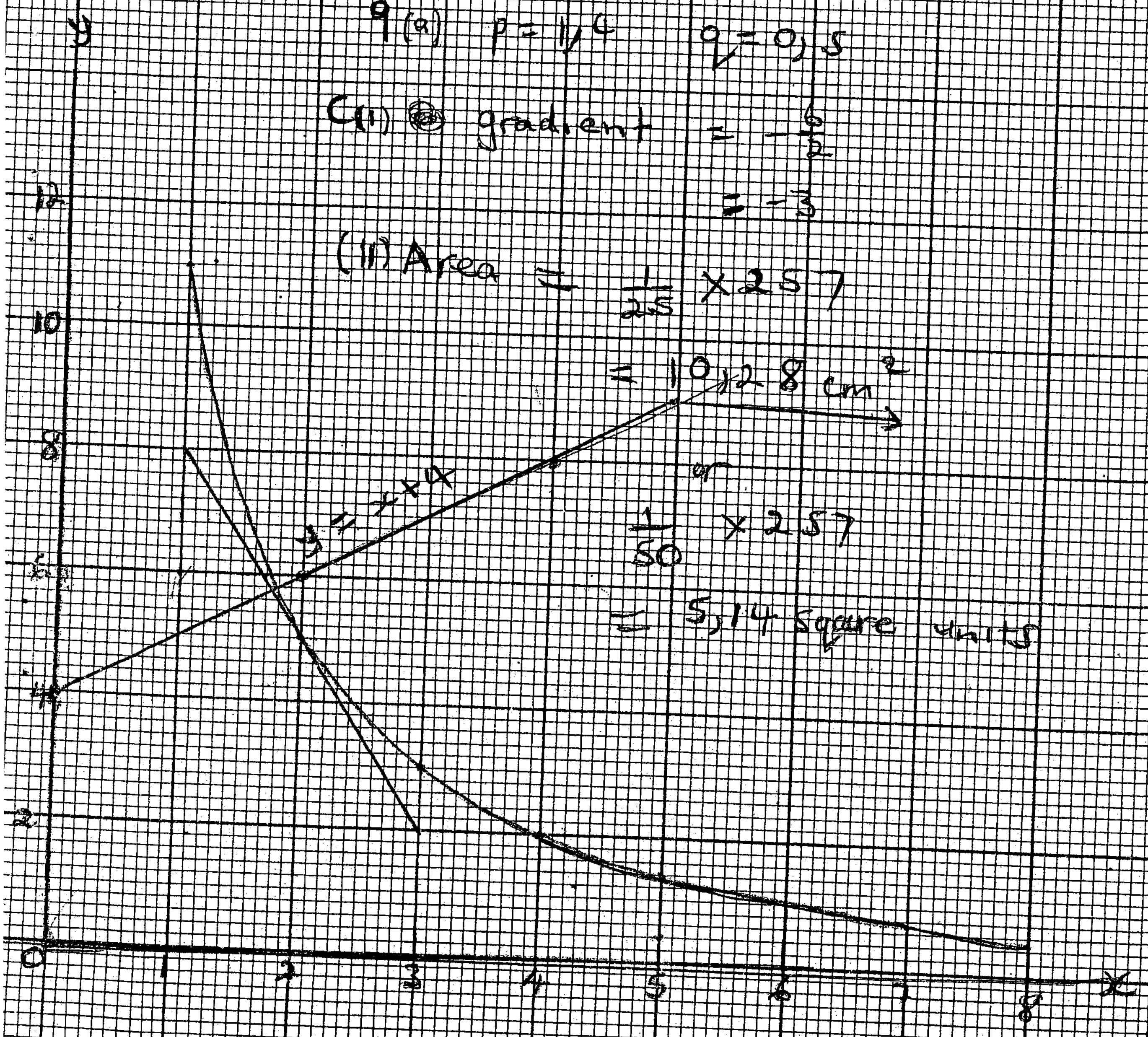
(ii) Area $= \frac{1}{25} \times 257$

$= 10,28\ cm^2$

or

$\frac{1}{50} \times 257$

$= 5,14$ square units



(d) $x = 1,8$ (where the graphs meet)

NOV 2006

Candidate Name ....

Subject .... Paper ....

Question No ...12...

159.

Centre Number	Candidate's Number

12a) $50 < x \leq 60$

(b) $25 \times 2 + 37,5 \times 5 + 47,5 \times 4 + 55 \times 6 + 65 \times 14 + 75 \times 6 + 90 \times 3$

$= 58,75$

(c) $m = \frac{4}{5}$

$= 0,8$

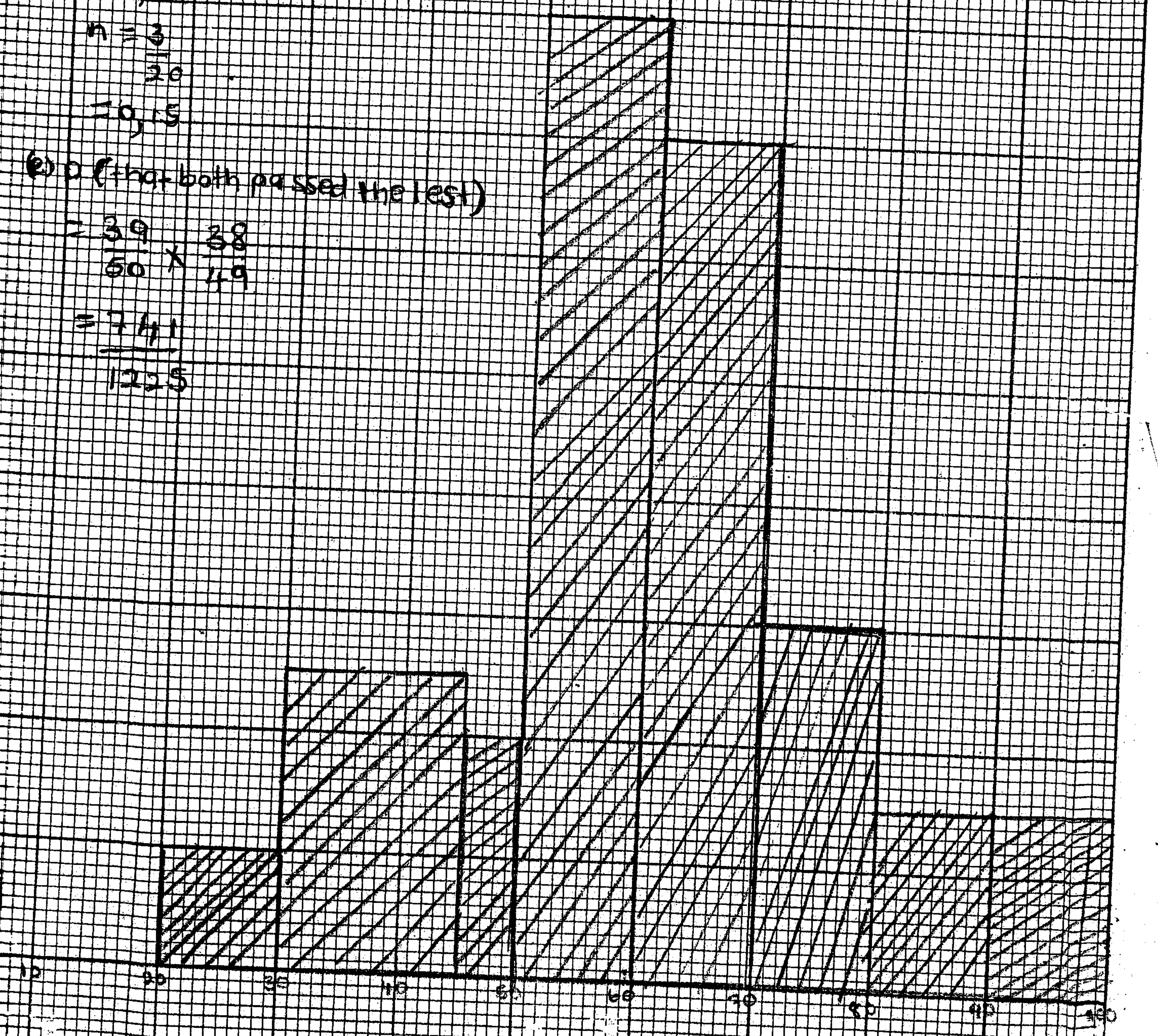
$n = \frac{3}{20}$

$= 0,15$

(e) p (that both passed the test)

$= \frac{39}{50} \times \frac{38}{49}$

$= \frac{741}{1225}$



Candidate Name

Centre Number	Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS
PAPER 1

4008/1, 4028/1

NOVEMBER 2008 SESSION 2 hours 30 minutes

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

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.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.
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 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.

FOR EXAMINER'S USE

This question paper consists of 26 printed pages and 6 blank pages.

[Turn over

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

For Examiner's Use

1 **(a)** Simplify

(i) $6{,}3 \times 1{,}1$, giving your answer as a decimal,

(ii) $\frac{2}{3} - \frac{3}{4}$, giving your answer as a common fraction.

(b) Find 5% of 130 metres.

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

(ii) ______________________ [1]

(b) ______________________ m [2]

For Examiner's Use

2 **(a)** Evaluate $54_6 + 305_6$, giving your answer in base 6.

(b) Convert 10011_2 to a number in base 3.

Answer (a) ______________________ [1]

(b) ______________________ [2]

3 Given that $94 \times 152 = 14\ 288$,

(a) find the value of N if $95 \times 152 = 14\ 288 + N$.

(b) Write down the exact value of

(i) $0{,}094 \times 1\ 520$,

(ii) $0{,}14\ 288 \div 0{,}0094$.

Answer (a) ______________________ [1]

(b) (i) ______________________ [1]

(ii) ______________________ [1]

33

4 **(a)** Simplify $(0{,}2)^3 \times (0{,}2)^2$, giving your answer as a decimal.

(b) Solve the equation

$$5x - 2(x+3) = 9.$$

Answer *(a)* ______________________ [1]

(b) $x =$ ______________________ [2]

34

5 **(a)** Write 0019 in 12-hour notation.

(b) Tapiwa and Netsai share some money in the ratio 2: 5. Given that Tapiwa's share is $620 000, calculate Netsai's share.

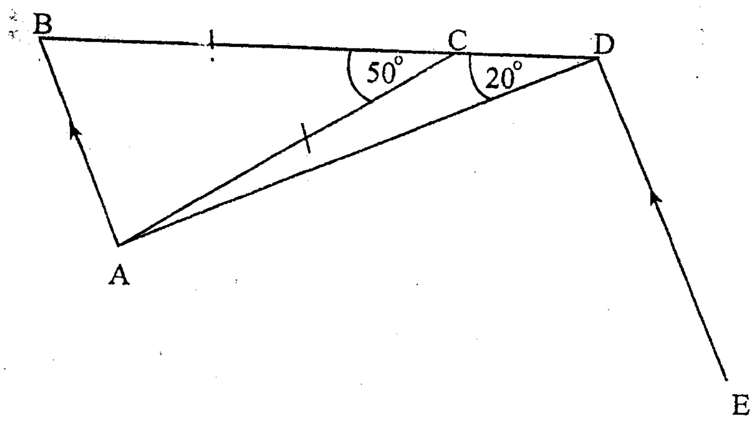
For Examiner's Use

Answer *(a)* ______________________ [1]

(b) $______________________ [2]

[Turn over

6



In the diagram, BCD is a straight line and AB is parallel to ED. Given that BC = AC, $A\hat{D}B = 20°$ and $A\hat{C}B = 50°$, calculate

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

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

(c) $A\hat{D}E$.

Answer *(a)* $B\hat{A}C =$ ______________________ [1]

(b) $D\hat{A}C =$ ______________________ [1]

(c) $A\hat{D}E =$ ______________________ [1]

7 Given that $m = 4 \times 10^6$ and $n = 2,4 \times 10^{-3}$ giving each answer in standard form, calculate

(a) mn,

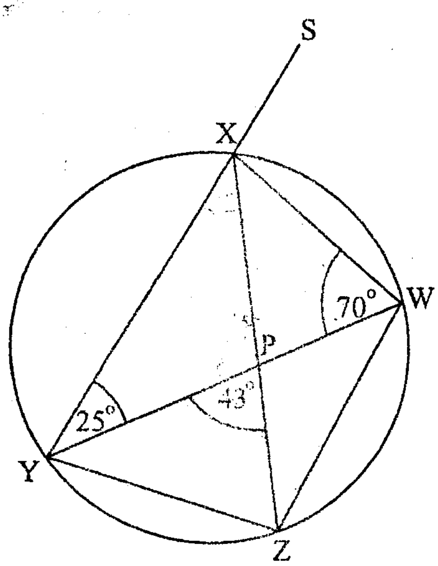
(b) $\frac{n}{m}$.

Answer *(a)* ______________________ [1]

(b) ______________________ [2]

37

8



WXYZ is a cyclic quadrilateral. The diagonals XZ and YW intersect at P and YX is produced to S. $Y\hat{W}X = 70°$, $X\hat{Y}P = 25°$ and $Y\hat{P}Z = 43°$.

Calculate

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

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

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

Answer *(a)* $X\hat{Z}Y =$ ______________________ [1]

(b) $Y\hat{X}Z =$ ______________________ [1]

(c) $S\hat{X}W =$ ______________________ [1]

Ex

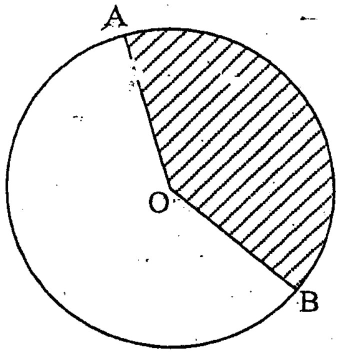
9 (a) The bearing of town B from town A is 141°. Find the bearing of town A from town B.

(b) The interior angle of a regular polygon is 162° Find the number of sides of the polygon.

Answer *(a)* ______________________ [1]

(b) ______________________ [2]

10



(a) In the diagram, the shaded sector AOB is $\frac{7}{15}$ of the circle centre O.
Calculate $A\hat{O}B$.

(b) Calculate the radius of a circle whose area is 154 cm^2.

[Take π to be $\frac{22}{7}$]

Answer *(a)* ____________________ [1]

(b) ____________________ cm [2]

For Examiner's Use

11 Taurai is x years old. Zvikomborero, her brother is 9 years older than her. Their father is 3 times as old as Taurai. Their mother is twice as old as Zvikomborero.

(a) Write down and simplify, in terms of x, an expression for the total age of the four members of the family.

(b) Given that the sum of the ages of the four members is 139 years, find the value of x.

Answer *(a)* ______________________ [1]

(b) $x =$ ______________________ [2]

[Turn over

12 The scale of a map is 1: 1 000 000.

Find

(a) the length, in cm, of a line on the map, which represents a road 160 km long,

(b) the actual area of a piece of land which is represented by 2,64 cm^2 on the map, giving your answer in km^2.

Answer *(a)* ____________________ cm [2]

(b) ____________________ km^2 [2]

For Examiner's Use

13 If $f(x) = x^2 - 7x + 5$, find

(a) $f(-1)$,

(b) the values of x for which $f(x) = -7$.

Answer *(a)* ______________________ [1]

(b) $x =$ __________ or __________ [2]

[Turn over

14 A bag contains red, blue and green counters all of which are identical except for colour.

A counter is picked at random from the bag. Its colour is noted and then it is replaced. The probability that it is red is 0,2 and the probability that it is blue is 0,5.

(a) Calculate the probability that the counter picked is either blue or green.

(b) Two counters are picked at random one after the other, with replacement. Calculate the probability that one is red and the other is blue.

Answer *(a)* ____________________ [1]

(b) ____________________ [2]

44

15 (a) Factorise $x^2 - y^2$.

(b) Given that $x - y = 4$ and $x^2 - y^2 = 20$, find the value of x and the value of y.

Answer (a) ______________________ [1]

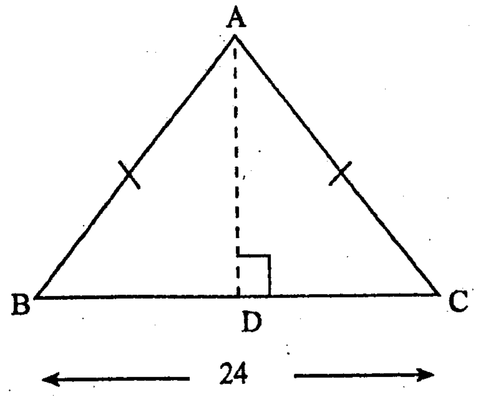
(b) $x =$ ______________________ [1]

$y =$ ______________________ [3]

For Examiner's Use

45

16



The diagram shows an isosceles triangle ABC with AB = AC, BC = 24 cm and AD is perpendicular to BC.

Given that the area of the triangle is 108 cm^2, find

(a) AD,

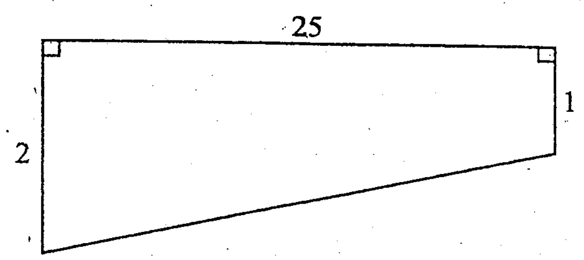
(b) AC.

Answer *(a)* AD = ______________ cm [2]

(b) AC = ______________ cm [2]

46

17



The diagram shows a cross-section of a swimming pool which is 25 m long, 1 m deep at the shallow end and 2 m deep at the deep end.

(a) Calculate the area of the cross-section in m^2.

(b) Given that the swimming pool is 10 m wide, calculate the volume of the pool in m^3.

Answer *(a)* ______________________ m^2 [2]

(b) ______________________ m^3 [2]

For Examiner's Use

[Turn over

47

18 Given that $\log_5 2 = 0{,}431$ and $\log_5 3 = 0{,}683$, find the value of

(a) $\log_5 1\frac{1}{2}$,

(b) $\log_5 \sqrt{3}$.

Answer *(a)* ____________________ [2]

(b) ____________________ [2]

48

19 (a) It is given that $\overrightarrow{AB} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$ and $\overrightarrow{BC} = \begin{pmatrix} -8 \\ 6 \end{pmatrix}$.

Find

(i) $\overrightarrow{AC}$,

(ii) $\overrightarrow{CX}$, given that $2\overrightarrow{CX} = \overrightarrow{BC}$.

(b) P is the point (−3; 2) and $\overrightarrow{PQ} = \begin{pmatrix} 3 \\ -5 \end{pmatrix}$.

Find the coordinates of point Q.

Answer *(a)* (i) $\overrightarrow{AC} = \begin{pmatrix} \quad \end{pmatrix}$ [1]

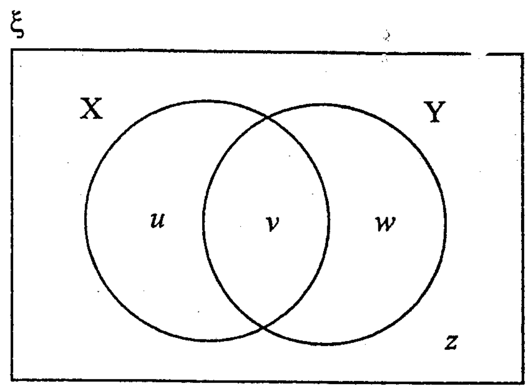
(ii) $\overrightarrow{CX} = \begin{pmatrix} \quad \end{pmatrix}$ [1]

(b) (________;__________) [2]

[Turn over

Exa:

– 49



The Venn diagram shows the universal set ξ, set X and set Y. The letters u, v, w and z represent the numbers of elements in each subset.

It is given that $n(\xi) = 150$; $n(X) = 55$ and $n(Y) = 32$.

Find

(a) the smallest possible value of z,

(b) the largest possible value of v,

(c) the value of w if $u = 45$.

Answer *(a)* ____________________ [1]

(b) ____________________ [1]

(c) ____________________ [1]

50

For Examiner's Use

21 **(a)** During a sale, a shop reduced all its prices by 20%. Calculate the original price of an article which was sold during the sale for \$440 000.

(b) On a particular day, a bank bought British pounds (£) at a rate of 1 British pound (£) to 35 000 Zimbabwean dollars (\$) and sold British pounds (£) at a rate of \$40 000 per £.

Calculate

(i) the amount, in British pounds, bought for \$10 500 000,

(ii) the amount, in Zimbabwean dollars, received for selling £112.

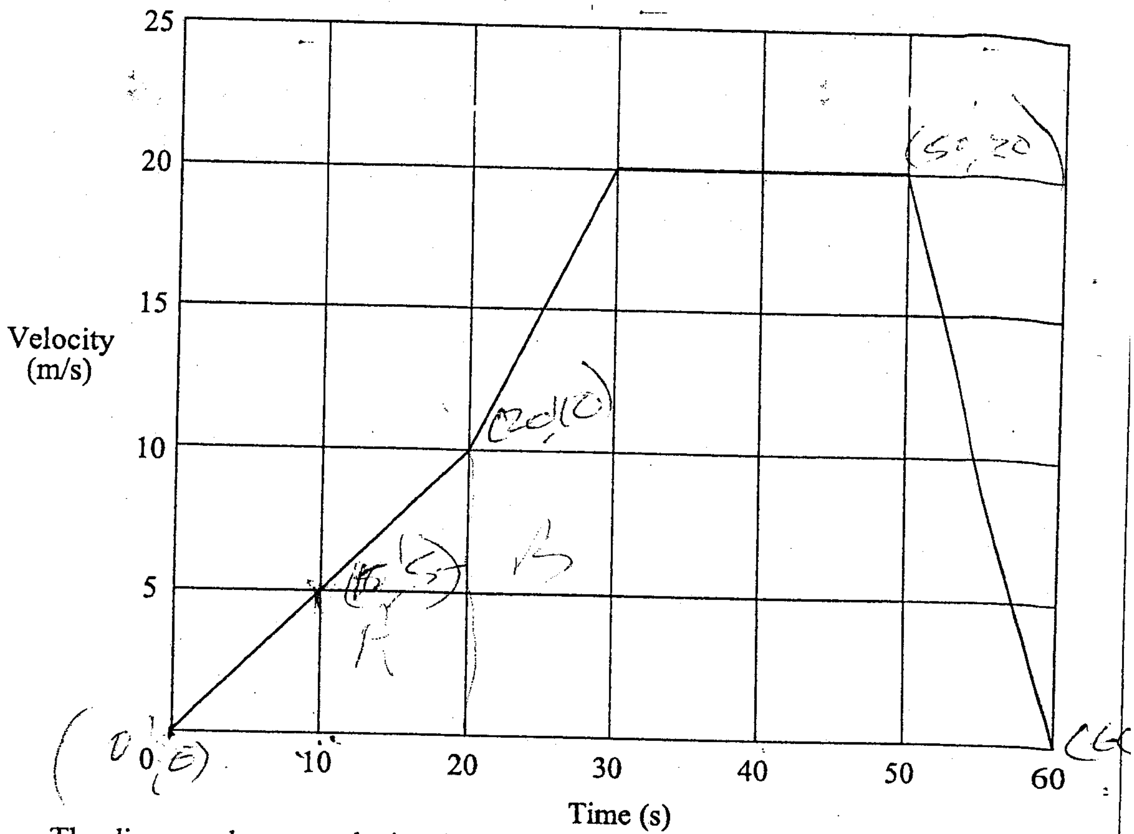
Answer *(a)* \$ ____________________ [2]

(b) *(i)* £ ____________________ [2]

(ii) \$ ____________________ [1]

[Turn over

51



The diagram shows a velocity-time graph for a particular journey. Calculate

(a) the distance travelled in the first 30 seconds,

(b) the speed when the time is 40 seconds,

(c) the deceleration during the last 10 seconds.

Answer *(a)* ____________________ m [2]

(b) ____________________ m/s [1]

(c) ____________________ m/s^2 [2]

For Examiner's Use

23 x is partly constant and partly varies as y.

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

(b) Given that $x = 1$ when $y = 8$ and that $x = 3$ when $y = 12$, calculate the value of

(i) h,

(ii) k.

(c) Find the value of x when $y = 30$.

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

(b) *(i)* $h =$ ________________ [1]

(ii) $k =$ ________________ [1]

(c) $x =$ ________________ [2]

53

Mark	0	1	2	3	4	5	6	7	8	9	10
No of pupils who scored this mark	0	1	3	7	9	5	2	2	1	2	0

The table shows the test results of a class of pupils. The test was marked out of 10.

(a) Find

(i) the number of pupil, in the class,

(ii) the modal mark,

(iii) the range of marks scored by the pupils.

(b) Calculate the percentage of pupils who scored less than 5 marks.

1 +

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

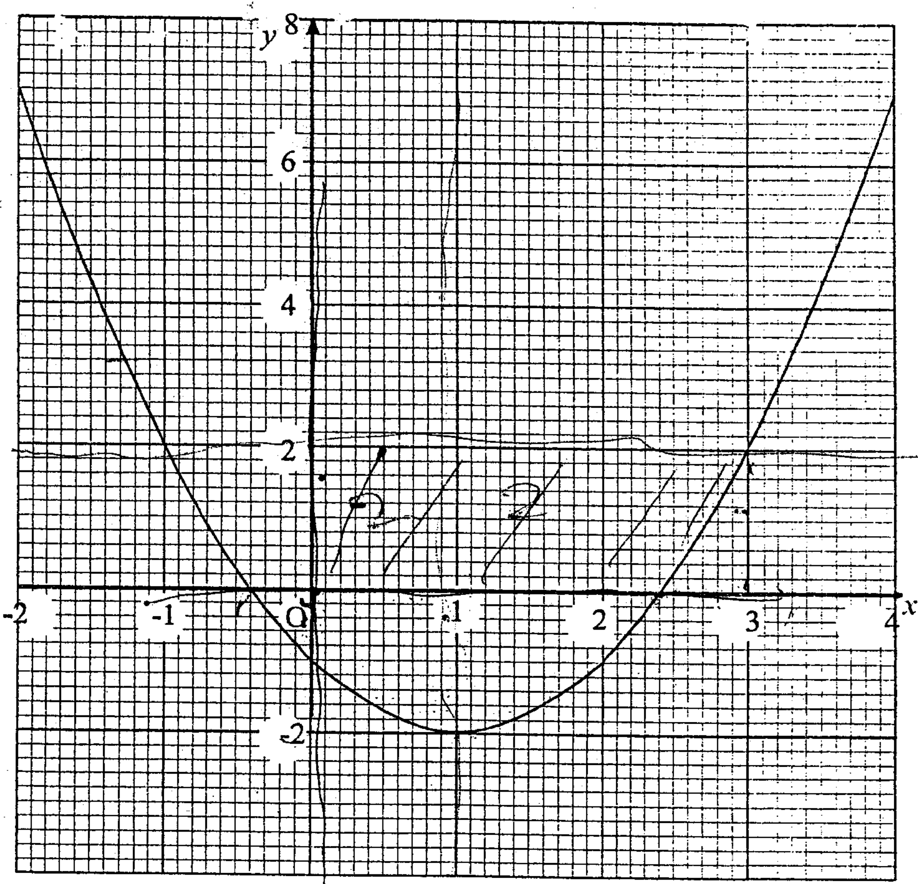
(ii) ____________ [1]

(iii) ____________ [1]

(b) ____________ % [2]

54

For Examiner's Use



The diagram shows the graph of the function $y = x^2 - 2x - 1$. Use the graph to find

(a) the roots of the equation $x^2 - 2x - 1 = 0$,

(b) the minimum value of $x^2 - 2x - 1$,

(c) the equation of the line of symmetry,

(d) the area enclosed by the curve, the x-axis, the y-axis and the line $x = 2$.

Answer *(a)* $x =$ ____________ or ____________ [2]

(b) ____________________ [1]

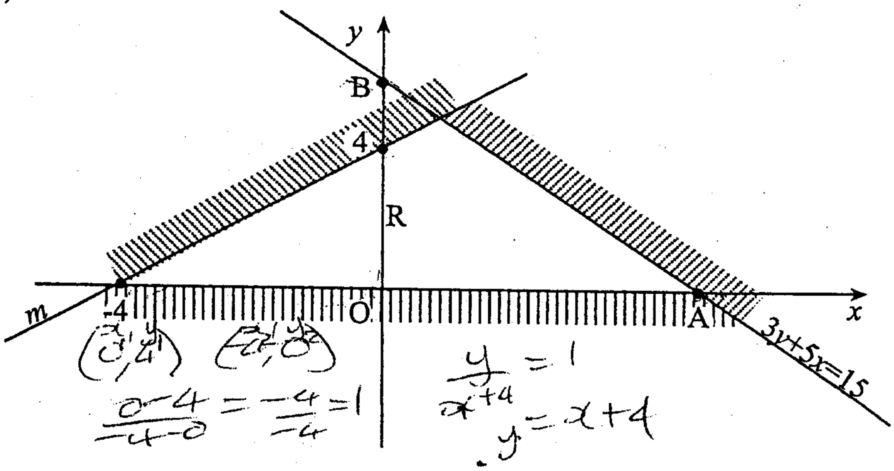
(c) ____________________ [1]

(d) 5,4 ____________________ [2]

55

26 **(a)** Solve the equation $(2x-3)^2 = 9$.

(b)



$(0;4)$ $(-4;0)$

$\frac{0-4}{-4-0} = \frac{-4}{-4} = 1$

$\frac{y}{x+4} = 1$

$y = x+4$

In the diagram, line m passes through the points $(-4; 0)$ and $(0;4)$. The line $3y+5x=15$ cuts the x-axis and the y-axis at A and B respectively.

(i) Write down the coordinates of A and the coordinates of B.

(ii) Find the equation of line m.

(iii) Write down two inequalities, other than $y \geq 0$, which define the region R.

Answer *(a)* $x =$ __________ or __________ [2]

(b) *(i)* A(____ ; ____)

B(____ ; ____) [2]

(ii) ________________ [2]

(iii) ________________ [2]

56

2008/01

NOVEMBER 2008 SESSION 4008/1: EXPECTED ANSWERS

1(a)
$$\begin{array}{r} 6{,}3 \\ \underline{1{,}1} \\ 630 \\ \underline{63} \\ \underline{6{,}93} \end{array}$$

(b) $\frac{2}{3} - \frac{3}{4}$

$$\frac{4(2) - 3(3)}{12}$$

$$= \frac{8-9}{12}$$

$$= -\frac{1}{12}$$

(c) $\frac{5}{100} \times 130$

$$= \frac{65}{10}$$

= 6,5 meters

2(a)
$$\begin{array}{r} 54_6 \\ \underline{305_6} \\ \underline{403_6} \end{array}$$

(b) $10011_2 = 1\times2^4+1\times2^1+1\times2^0$

$= 19$

$$\begin{array}{r|l} 3 & 19 \\ \hline 3 & 6 \text{ r } 1 \\ 3 & 2 \text{ r } 0 \\ & 0 \text{ r } 3 \end{array}$$

$= 301_3$

3 (a) $94\times152 = 14288$

$95\times152 = 14288 + 152$

(b) (i) $0{,}094\times1520$

$$= \frac{94}{1000} \times 152 \times 10$$

$$= \frac{14288\times10}{1000}$$

$$= \frac{142880}{1000}$$

$$= 142{,}88$$

(b)(ii) $\frac{14288}{100000} \div \frac{94}{10000}$

$$\frac{14288}{100000} \times \frac{10000}{94}$$

$$= 15{,}2$$

4 (a) (0,2)3×(0,2)2

= (0,2)3+2

= (0,2)5

= 0,00032

(b) $5x - 2(x+3) = 9$

$5x - 2x - 6 = 9$

$3x - 6 = 9$

$3x = 9+6$

$\frac{3x}{3} = \frac{15}{3}$

$x = 5$

5(a) 0019 is 1219am

(b) $\frac{5}{2} \times 620000$

= $1550000

6(a) $\hat{BAC} = \frac{180 - 50}{2}$

$= \frac{130}{2} = 65°$

(b) $\hat{DAC} = 180 - (20+65+65)$

$= 30°$

(c) $\check{ADE} = 180 - (20+65)$

$= 95°$

7(a) mn
$= 4\times10^{6} \times 2{,}4\times10^{-3}$
$= 9{,}6\times10^{6+-3}$
$= 9{,}6\times10^{3}$

(b) $\dfrac{m}{n}$
$= \dfrac{2{,}4\times10^{-3}}{4\times10^{6}}$

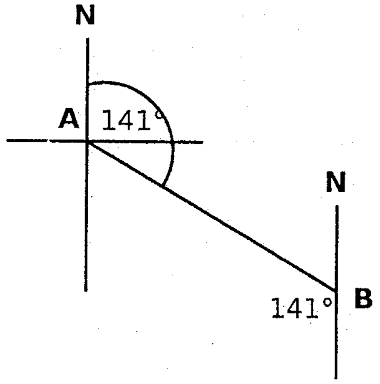
$= 0{,}6\times10^{-3-6}$
$= 0{,}6\times10^{-9}$
$= 6\times10^{-10}$

8(a) $X\check{Z}Y = 70°$ angles subtended by the same arc

(b) $Y\dot{X}Z = 180 - (137 - 25)$
$= 18°$

(b) $S\dot{X}W = 180 - (18+67)$
$= 95°$

9(a)



Bearing of A from B is $180 + 141$
$= 321°$

(b) Exterior angle $= 180 - 162$
$= 18°$

Total exterior angles $= 360$

$\therefore$ Number of sides $= \dfrac{360}{18}$

$= 20$

10(a) $\dfrac{7}{15} \times 360$

$= 168°$

(b) Area $= \pi r^2$
$154 = \dfrac{22}{7} \times r^2$

$154\times7 = 22r^2$

$\dfrac{1078}{22} = \dfrac{22r^2}{22}$

$49 = r^2$
$\sqrt{49} = r$
$r = 7$

11(a) Taurai's age $= x$
Zviko's age $= x + 9$
Father's age $= 3x$
Mother's age $= 2(x + 9)$
$= 2x + 18$

$x + x + 9 + 3x + 2x + 18$
$x + x + 3x + 2x + 9 + 18$
$= 7x + 27$

(b) $7x + 27 = 139$
$7x = 139 - 27$

$\dfrac{7x}{7} = \dfrac{112}{7}$

$x = 16$

12(a) Actual $= 160\times100\ 000$ cm
$= 16\ 000\ 000$ cm

$\therefore$ On the map $= \dfrac{16\ 000\ 000}{1\ 000\ 000}$
$= 16$

Actual area $= 2{,}64\times10^{12}$ cm^2
$\therefore$ In square km $= \dfrac{2{,}64\times10^{12}}{10^{10}}$ km^2
$= 2{,}64\times10^{12-10}$
$= 2{,}64\times10^{2}$
$= 264$ km^2

$$\left(\begin{array}{c} 100\ 000\text{cm} = 1\text{ km} \\ (100\ 000\text{cm})^2 = (1\text{km})^2 \\ 10^{10}\text{cm}^2 = 1\text{km}^2 \end{array}\right)$$

(b) Ratio of length
$1 : 1\ 000\ 000$

Ratio of areas
$1^2 : 1\ 000\ 000^2$
$1 : 10^{12}$

13(a) $f(x) = x^2 - 7x + 5$
$= (-1)^2 - 7(-1) + 5$
$= 1 + 7 + 5$
$= 13$

(b) $f(x) = x^2 - 7x + 5$
$x^2 - 7x + 5 = -7$
$x^2 - 7x + 5 + 7 = 0$
$x^2 - 7x + 12 = 0$
$x^2 - 3x - 4x + 12 = 0$
$x(x-3) - 4(x-3) = 0$
$(x-3)(x-4) = 0$
$x = 3$ or 4

14(a) $^2/_{10} + {}^5/_{10} = {}^7/_{10}$ or $0{,}7$

(b) P(one is red and the other blue)
P(r & b) or P(b & r)
$= {}^2/_{10}\times{}^5/_{10} + {}^5/_{10}\times{}^2/_{10}$
$= \dfrac{20}{100}$
$= ⅕$

15(a) $(x+y)(x-y)$
(b) $x - y = 4$ $\quad (x+y)(x-y) = 20$
$\dfrac{(x+y)(x-y)}{(x-y)} = \dfrac{20}{4}$

$x + y = 5$

(1) $x - y = 4$ $\quad$ *(1)* $4{,}5 - y = 4$
(2) $x + y = 5$ $\quad$ $4{,}5 - 4 = y$
$\frac{1}{2} = y$

$\dfrac{2x}{2} = \dfrac{9}{2}$
x
$= 4{,}5$

16(a) $\frac{1}{2}\times24\times AD = 108$

$\dfrac{12AD}{12} = \dfrac{108}{12}$

$AD = 9$

(b) $AC^2 = 9^2 + 12^2$
$AC^2 = 81 + 144$
$AC^2 = 225$
$AC = \sqrt{225}$
$= 15$

17(a) $\frac{1}{2}\times(1+2)\times25$
$= 3\times12{,}5$
$= 37{,}5$m^2

(b) $37{,}5\text{m}^2\times10\text{m}$
$= 375\text{m}^3$

18(a) $\log{}^3/_2 = \log 3 - \log 2$ $= 0{,}683 - 0{,}431$ $= 0{,}252$	**(b)** $\log 3^{½}$ $= ½\log 3$ $= ½ \times 0{,}683$ $= 0{,}3415$
19(a) $AC = \begin{pmatrix} 2 \\ 4 \end{pmatrix} + \begin{pmatrix} -8 \\ 6 \end{pmatrix}$ $= \begin{pmatrix} -6 \\ 10 \end{pmatrix}$ **(i)** CX = ½BC $= \frac{1}{2} \begin{pmatrix} -8 \\ 6 \end{pmatrix}$ $= \begin{pmatrix} -4 \\ 3 \end{pmatrix}$	**(b)** $\begin{pmatrix} 3 \\ -5 \end{pmatrix} = \overset{Q}{\begin{pmatrix} x \\ y \end{pmatrix}} - - \overset{P}{\begin{pmatrix} -3 \\ 2 \end{pmatrix}}$ $\begin{pmatrix} 3 \\ -5 \end{pmatrix} + \begin{pmatrix} -3 \\ 2 \end{pmatrix} = \begin{pmatrix} x \\ y \end{pmatrix}$ $\begin{pmatrix} 0 \\ -3 \end{pmatrix} = Q$ Q(0 ; -3)
20(a) 150 – (55+32) = 63 **(b)** 32	**(c)** u v ∴ w = 22 45 10
21(a) 80% = 440 000 ∴ original price = $\frac{100}{80} \times 440\,000$ = 550 000 **(b)(i)** $\frac{10\,500\,000}{35\,000}$ = £300	**(ii)** 40 000 × 112 4000000 400000 80000 $4 480 000
22(a) ½×20×10 + ½(20+10)×10 100m + 150m = 250m	**(b)** 20m/s **(c)** $\frac{20m/s}{10s} = 2m/s^2$
23(a) $x = h + ky$ **(b)** *(1)* 1 = h + 8k *(2)* 3 = h + 12k $\frac{-2}{-4} = \frac{-4k}{-4}$ k = ½	*(1)* 1 = h + ½(8) 1 = h + 4 1 – 4 = h h = –3

24(a)(i) $1+3+7+9+5+2+2+1+2$ $= 32$ **(ii)** 2 **(iii)** $9 - 1 = 8$	**(b)** $\frac{1+3+7+9}{32} \times \frac{100}{1}$ $= \frac{20}{32} \times \frac{100}{1}$ $= 62{,}5\%$
25(a) $x = -1{,}4$ or $2{,}4$ **(b)** -2 **(c)** $x = 1$	**(d)** $\frac{1}{25} \times 268$ or $\frac{1}{50} \times 268$ $= 10{,}72\text{cm}^2$ $= 5{,}36\text{cm}^2$
26(a) $2x - 3 = \sqrt{9}$ $2x - 3 = \pm 3$ $2x - 3 = 3$ or $2x - 3 = -3$ $2x = 6$ or $2x = 0$ $x = 3$ or $x = 0$	**(b)(i)** $3(0) + 5x = 15$ $5x = 15$ $x = 3$ $\therefore$ A $(3\,;\,0)$ $3y + 5(0) = 15$ $3y = 15$ $y = 5$ $\therefore$ B $(0\,;\,5)$

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Ordinary Level

MATHEMATICS
PAPER 2

4008/2

NOVEMBER 2008 SESSION 2 hours 30 minutes

Additional materials:
- Answer paper
- Geometrical instruments
- Graph paper (3 sheets)
- Mathematical tables
- Plain paper (1 sheet)

TIME 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces provided on the answer paper/answer booklet.

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

Write your answers on the separate answer paper provided.
If you use more than one sheet of paper, fasten the sheets together.

Electronic calculators must not be used.

All working must be clearly shown. It should be done on the same sheet as the rest of the answer.
Omission of essential working will result in loss of marks.
If the degree of accuracy is not specified in the question and if the answer is not exact, the answer should be given to three significant figures. Answers in degrees should be given 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 may be used to evaluate explicit numerical expressions.

This question paper consists of 11 printed pages and 1 blank page.

[Turn over

Section A [64 marks]

Answer all the questions in this section.

1 (a) Express $3\frac{2}{5} - 2\frac{13}{20}$ as a single fraction in its lowest terms. [2]

(b) Remove the brackets and simplify

$$3(a+2c)-4(2a-c).$$

[2]

(c) Solve the equation

$$\frac{4x-5}{7}=1\frac{3}{4}.$$

[3]

(d) Find the number of circular rings each of diameter 6,3 cm which can be made from a wire 19,8 m long.

$\left(\text{Use } \pi = \frac{22}{7}\right)$.

[4]

---

2 (a) Factorise completely

(i) $2x^2 + ax - 2bx - ab$,

(ii) $3 - 12y^2$.

[4]

(b) It is given that P(4; 8) and R(−4; −2) are points on the Cartesian plane.
Find

(i) $\overrightarrow{PR}$ as a column vector,

(ii) $|\overrightarrow{PR}|$.

[3]

(c) Two cyclists, Alice and John, started a journey at the same time from two villages which are 27 km apart. Alice cycled at x km/h and John cycled at $2x$ km/h. They travelled towards each other and met after $\frac{3}{4}$ hour.

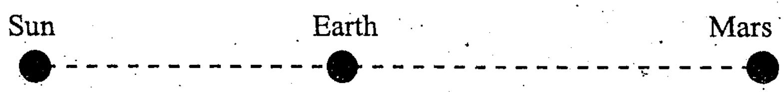
(i) Write down, in terms of x, the distance that Alice travelled in $\frac{3}{4}$ hour.

(ii) Form an equation in x and solve it.

(iii) Hence write down the numerical value of John's speed. [4]

---

3 **(a)**



In the diagram, the Sun, Earth and Mars are in a straight line. It is given that the Earth is $1{,}496 \times 10^{8}$ km from the Sun and Mars is $2{,}279 \times 10^{8}$ km from the Sun.

932,6388

(i) Write down $1{,}496 \times 10^{8}$ in ordinary form.

(ii) Find, in standard form, the distance of Mars from the Earth. [3]

(b) In a certain year, a paint manufacturer mixed 27 litres of white paint with 9 litres of red paint to produce 36 litres of **pink** paint. If one litre of the white paint cost \$36 800 and the average cost of the **pink** paint was \$33 575 per litre, calculate the cost of one litre of the red paint then. [3]

1 208

2151

(c) **(i)** Solve the simultaneous inequalities

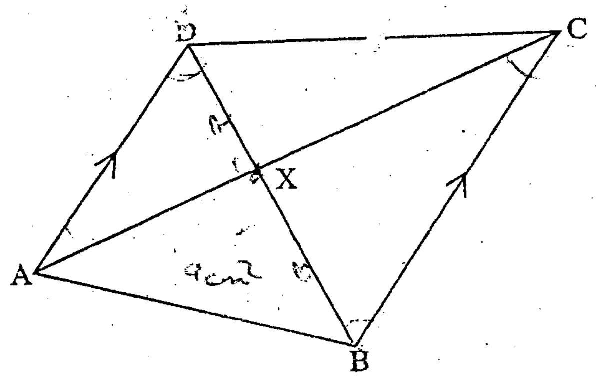
$$2x - 6 < 5x + 3 \leq 3x + 11$$

giving your answer in the form $a < x \leq b$ where a and b are integers.

(ii) Write down the least possible value of x. [4]

[Turn over

(a)



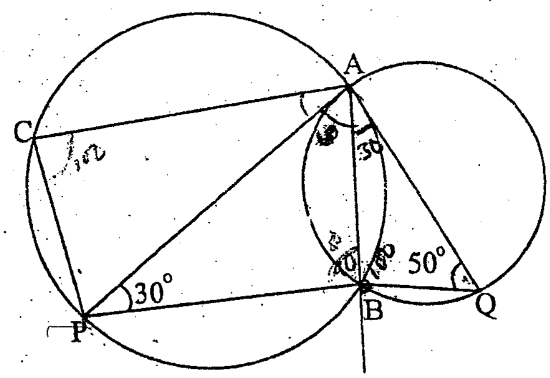
In the diagram, ABCD is a quadrilateral in which AD is parallel to BC and AC and BD intersect at X such that the ratio BX: XD = 3: 2. Given that $\Delta ABX = 9\ cm^2$ in area,

(i) calculate the area of ΔADX,

(ii) name, in correct order, the triangle which is similar to ΔBCX,

(iii) hence calculate the area of ΔBCX. [5]

(b)



In the diagram, AP and AQ are tangents to the circles ABQ and ABPC respectively. Given that $A\hat{P}B = 30°$ and $A\hat{Q}B = 50°$,

calculate

(i) $B\hat{A}P$,

(ii) $B\hat{A}Q$,

(iii) reflex $P\hat{B}Q$,

(iv) $A\hat{C}P$. [6]

5 (a) Express as a single fraction in its simplest form

$$n + \frac{2n}{6n + 5}.$$ [2]

(b) Make m the subject of the formula

$$a = \frac{m - 5}{3m - 2}.$$ [3]

(c) Given that $\mathbf{A} = \begin{pmatrix} 3 & 5 \\ -2 & 7 \end{pmatrix}$ and $\mathbf{B} = \begin{pmatrix} 5 & y \\ y & 3 \end{pmatrix}$ find

(i) $\mathbf{A}^2$,

(ii) the two possible values of y given that the determinant of the matrix $\mathbf{B}$ is $5y + 1$. [5]

---

6 **Answer the whole of this question on a sheet of plane paper.**

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

(a) On a **single** diagram, construct

(i) a line OP, 9 cm long,

(ii) a circle centre O and radius 3,5 cm,

(iii) the locus of points which are equidistant from O and P,

(iv) the circle whose diameter is OP to cut the circle centre O at R and Q,

(v) the two tangents to the circle centre O from the point P. [7]

(b) OP represents a certain locus. Describe this locus **fully**. [2]

(c) A point T lies inside the quadrilateral PQOR and is such that it is nearer PQ than PR and nearer O than P. Given also that OT ≥ 3,5 cm, show by shading clearly the region in which T lies. [2]

Section B [36 marks]

Answer any three questions in this section.

1 **Answer the whole of this question on a sheet of graph paper.**

Mass (m kg)	$35 < m \leq 45$	$45 < m \leq 50$	$50 < m \leq 55$	$55 < m \leq 60$	$60 < m \leq 70$
Frequency	p	11	13	8	3
Frequency density	0,5	2,2	2,6	q	0,3

The table gives the masses, m kg, of a group of students at a teachers' college.

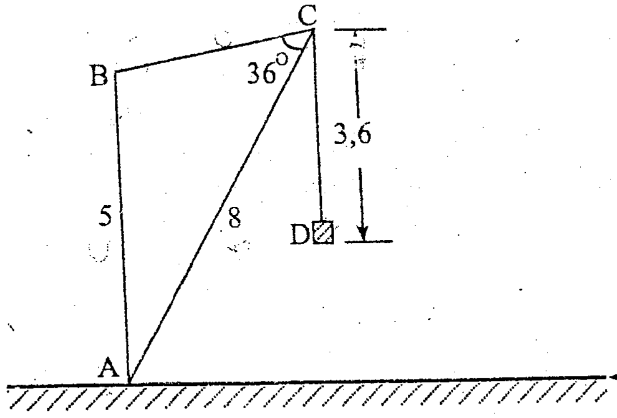
(a) Find the value of p and the value of q. [2]

(b) Using a horizontal scale of 2 cm to represent 5 kg and a vertical scale of 4 cm to represent 1 unit of frequency density, draw a histogram of the data. [4]

(c) Calculate an estimate of the mean mass of the students in the group whose masses are greater than 45 kg. [3]

(d) Two students are chosen at random from the whole group. Find the probability that each of them has a mass which is greater than 50 kg. [3]

8 (a)

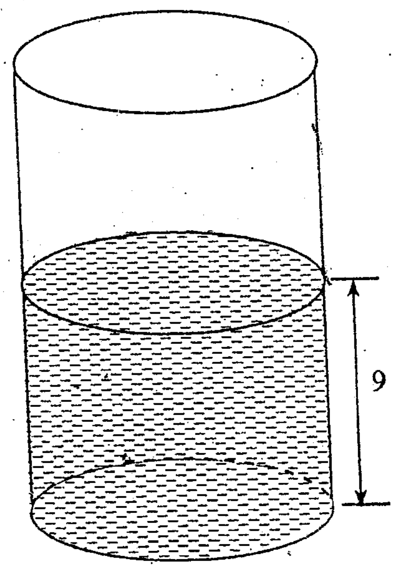


In the diagram, ABC is a crane lifting a load D. AB and BC are beams and ACD is a string. Given that the vertical beam AB = 5 m, AC = 8 m, CD = 3,6 m and $B\hat{C}A$ calculate

(i) $A\hat{B}C$,

(ii) the height of D above the ground level. [6]

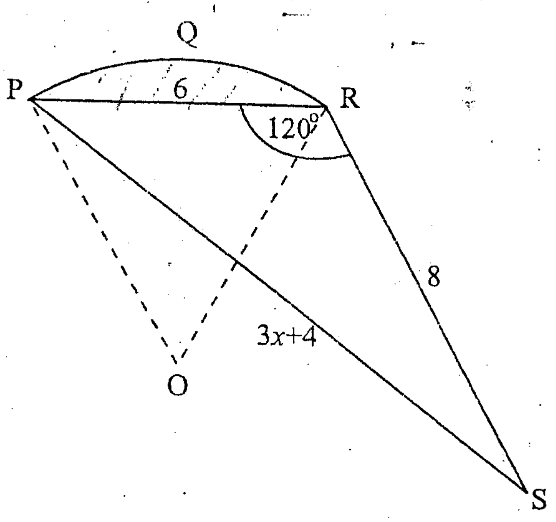
(b)



The diagram shows a vertical cylindrical container with water up to a height of 9 cm. The volume of the water in the container is 512 cm^3. A metal solid, of volume 217 cm^3, is lowered into the container until the solid is completely immersed in water. Calculate the height by which the water level rises in the container. Give your answer correct to the nearest millimetre. [6]

[Turn over

9



Take π to be = 3,142

In the diagram, PQR is a segment of a circle of radius 6 cm and centre O.
PR = 6 cm, RS = 8 cm, PS = $(3x+4)$ cm and $P\hat{R}S = 120°$.

(a) Calculate the area of the segment PQR. [4]

(b) **(i)** Form an equation in x and show that it reduces to $3x^2+8x-44=0$.

(ii) Solve the equation $3x^2+8x-44=0$ giving your answers correct to 2 decimal places. [8]

10 **Answer the whole of this question on a sheet of graph paper.**

A stone is thrown into the air. Its height h metres after t seconds is given by the formula $h = 60 + 30t - 5t^2$.

Below is a table of values for $h = 60 + 30t - 5t^2$.

Time (t seconds)	0	1	2	3	4	5	6	7	8
Height h(metres)	60	85	100	p 105	100	85	60	q 25	−20

(a) Find the value of p and the value of q. [2]

(b) Using a horizontal scale of 2 cm to represent 1 second and a vertical scale of 2 cm to represent 20 metres, draw the graph of $h = 60 + 30t - 5t^2$ for $0 \le t \le 8$. [8]

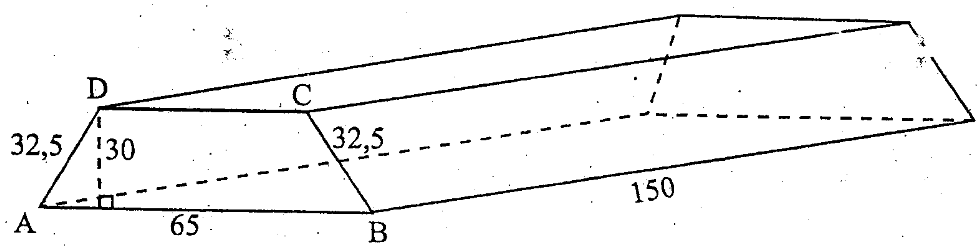
(c) Use your graph to find

(i) the maximum height reached by the stone,

(ii) the velocity of the stone when $t = 2$,

(iii) the times when the stone is at a height of 80 m. [6]

11



The diagram shows a wooden block of length 150 cm, whose cross-section , ABCD is a trapezium in which AB is parallel to DC. AB = 65 cm, AD = BC = 32,5 cm and the perpendicular height is 30 cm.

(a) Calculate

(i) the length CD given that the area of the trapezium is 1 575 cm^2,

(ii) the volume of the block,

(iii) the mass of the block given that the density of the wood of which it is made, is 0,72 g/cm^3,

(iv) the total surface area of the block. [10]

(b) The block is to be varnished. One litre of varnish covers an area of 2 000 cm^2 and is bought in 5-litre tins only. Calculate the number of tins of varnish that need to be bought to varnish the whole block. [2]

12 **Answer the whole o f this question on a sheet of graph paper.**

A quadrilateral E with vertices (–8; –4), (–4; –4), (–6; –12) and (–10; –8) is the image of quadrilateral A with vertices (4; 2), (2; 2), (3; 6) and (5; 4).

Using a scale of 1 cm to represent 1 unit on both axes, draw the x and y axes for $-10 \le x \le 6$ and $-12 \le y \le 8$.

(a) **(i)** Draw and label clearly the quadrilateral E.

(ii) Draw and label clearly the quadrilateral A.

(iii) Write down the matrix which represents the transformation which maps E onto A. [5]

(b) Quadrilateral T with vertices (0; 6), (0; 4), (–4; 5) and (–2; 7) is the image of quadrilateral A under a certain transformation.

(i) Draw and label clearly the quadrilateral T.

(ii) Describe completely, the single transformation which maps A onto T. [4]

(c) A one-way stretch represented by $\begin{pmatrix} 1 & 0 \\ 0 & -1\frac{1}{2} \end{pmatrix}$ maps quadrilateral A onto quadrilateral S.

Draw and label clearly the quadrilateral S. [3]

NOVEMBER 2008 PAPER 2

1(a) $\frac{17}{5} - \frac{53}{20}$

$= \frac{4(17) - 53}{20}$

$= \frac{68 - 53}{20}$

$= \frac{15}{20}$

$= \frac{3}{4}$

(b) $3(a + 2c) - 4(2a - c)$
$= 3a + 6c - 8a + 4c$
$= 10c - 5a$

(c) $\frac{4x - 5}{7} = \frac{7}{4}$

$4(4x - 5) = 49$
$16x - 20 = 49$
$16x = 49 + 20$
$\frac{16x}{16} = \frac{69}{16}$

$x = 4\frac{5}{16}$

(d) Circumference $= 2\pi r$
$= \frac{2}{1} \times \frac{22}{7} \times 3{,}15$ (radius)

$= 19{,}8$cm

∴ number of rings that can be made
$= \frac{19{,}8\text{ m}}{19{,}8\text{cm}}$

$= \frac{1980}{19{,}8} \times \frac{10}{10}$

$= \frac{19800}{198}$

$= 100$

2(a) $2x^2 + ax - 2bx - ab$
$2x^2 - 2bx + ax - ab$
$2x(x - b) + a(a - b)$
$(2x + a)(x - b)$

(b) $3 - 12y^2$
$3(1 - 4y^2)$
$= 3(1-y)(1+y)$

(b) **PR** $= \begin{pmatrix} -4 \\ -2 \end{pmatrix} - \begin{pmatrix} 4 \\ 8 \end{pmatrix}$

$= \begin{pmatrix} -16 \\ -10 \end{pmatrix}$

$|\textbf{PR}| = \sqrt{(-16)^2 + (-10)^2}$

$= \sqrt{256 + 100}$

$= \sqrt{356}$

$= 18{,}86796$

$= 18{,}9$

(c)(i) Distance: Alice = speed × time
$= x \times \frac{3}{4}$ km
$= \frac{3}{4}x$ km

Distance: John $= 2x \times \frac{3}{4}$ km
$= \frac{3}{2}x$ km

(ii) $\frac{3}{4}x + \frac{3}{2}x = 27$
$3x + 6x = 27$

$\frac{9x}{9} = \frac{27}{9}$

$x = 3$

(iii) 2(3) km/h
$= 6$km/h

3(a)(i) $1{,}496\times10^8 = 1\ 496\ 000\ 000$

(ii) $2{,}279\times108 - 1{,}496\times108$

$108(2{,}279 - 1{,}496)$

$108(0{,}783)$

$= 0{,}783\times108$

$= 7{,}83\times107$

(b) Total cost for the white paint

$= \$27 \times 36800$

$= \$993\ 600$

Red = x(total cost)

$$\frac{993\ 600 + x}{36} = 33575$$

$993\ 600 + x = 1\ 208\ 700$

$\therefore\ x = 1\ 208\ 700 - 993\ 600$

$= \$215\ 100$

$\therefore$ cost of red paint per litre

$$= \frac{\$215\ 100}{9}$$

$= \$23\ 900$ per litre

(c)(i) $2x-6 < 5x+3$ $\qquad$ $5x+3 \le 3x+11$

$2x-5x < 3+6$ $\qquad$ $5x-3x \le 11-3$

$$\frac{-3x}{-3} < \frac{9}{-3} \qquad \frac{2x}{2} \le \frac{8}{2}$$

$x > -3$ $\qquad$ $x \le 4$

$-3 < x \le 4$

(ii) -2

4(a)(i) 3 : 2

$\therefore$ Area of $\Delta ADX = \frac{9}{3} \times 2$

$= 6\text{cm}^2$

(ii) BCX = DAX

(iii) BX : DX

3 $\quad$ 2

$\therefore$ ratio of areas $= 3^2 : 2^2$

$= 9 : 4$

$\therefore$ Area of BCX $= \frac{6}{4} \times 9$

$= \frac{27}{2}$

$= 13{,}5\text{cm}^2$

(b)(i) BAP = 50° angle between a tangent and a triangle bk 4

(ii) BAQ = 30° angle between a tangent and a triangle

(iii) reflex PBQ = 100°+100° = 200°

(iv) ACP = 80° opposite of a cyclic quad

5(a) $n + \dfrac{2n}{6n+5}$ $\dfrac{n(6n+5) + 2n}{6n+5}$ $\dfrac{6n^2 + 5n + 2n}{6n+5}$ $\dfrac{6n^2 + 7n}{6n+5}$	**(b)** $a = \dfrac{m-5}{3m-2}$ $a(3m-2) = m-5$ $3am - 2a = m - 5$ $3am - m = -5 + 2a$ $\dfrac{m(3a-1)}{3a-1} = \dfrac{-5+2a}{3a-1}$ $m = \dfrac{-5+2a}{3a-1}$

8(a)(i) $\frac{\sin 36}{5} = \frac{\sin ABC}{8}$ $\frac{8\sin 36}{5} = \sin ABC$ $0{,}94056 = \sin ABC$ $70{,}145814738 = ABC$ $\therefore ABC = 70{,}1°$	**(b)** 9cm = 512cm² 1cm = less $= \frac{512}{9}$ cm³ volume that represents 1cm³ $\therefore$ height $= 217 \times \frac{9}{512}$ $\left(\text{height} = 217 \div \frac{9}{512}\right)$ $= 3{,}814$cm
9(a) Area $\Delta OPR = \frac{1}{2} \times 6 \times 6 \sin 120$ cm² $= 18\sin 120$ cm² $= 10{,}45100132$ cm² $= 10{,}45$ cm² Area of the sector OPQR $= \frac{\theta}{360} \times \pi r^2$ $= \frac{60}{360} \times 3{,}142 \times 6^2$ $= 18{,}852$cm² $\therefore$ Area of the segment PQR $= 18{,}852 - 10{,}45$ $= 8{,}402$ cm²	**(b)(i)** $(3x+4)(3x+4) = 6^2+8^2 - 2\times6\times8\cos 120$ $9x^2 + 12x + 12x + 16 = 148$ $9x^2 + 24x + 16 - 148 = 0$ $9x^2 + 24 - 132 = 0$ $\frac{3(3x^2 + 8x - 44)}{3} = \frac{0}{3}$ $3x^2 + 8x - 44 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-8 \pm \sqrt{8^2 - 4\times3\times-44}}{6}$ $= \frac{-8 \pm \sqrt{592}}{6}$ $= \frac{-8 + 24{,}331}{6}$ or $\frac{-8 - 24{,}331}{6}$ $\therefore x = 2{,}72$ or $x = -5{,}39$

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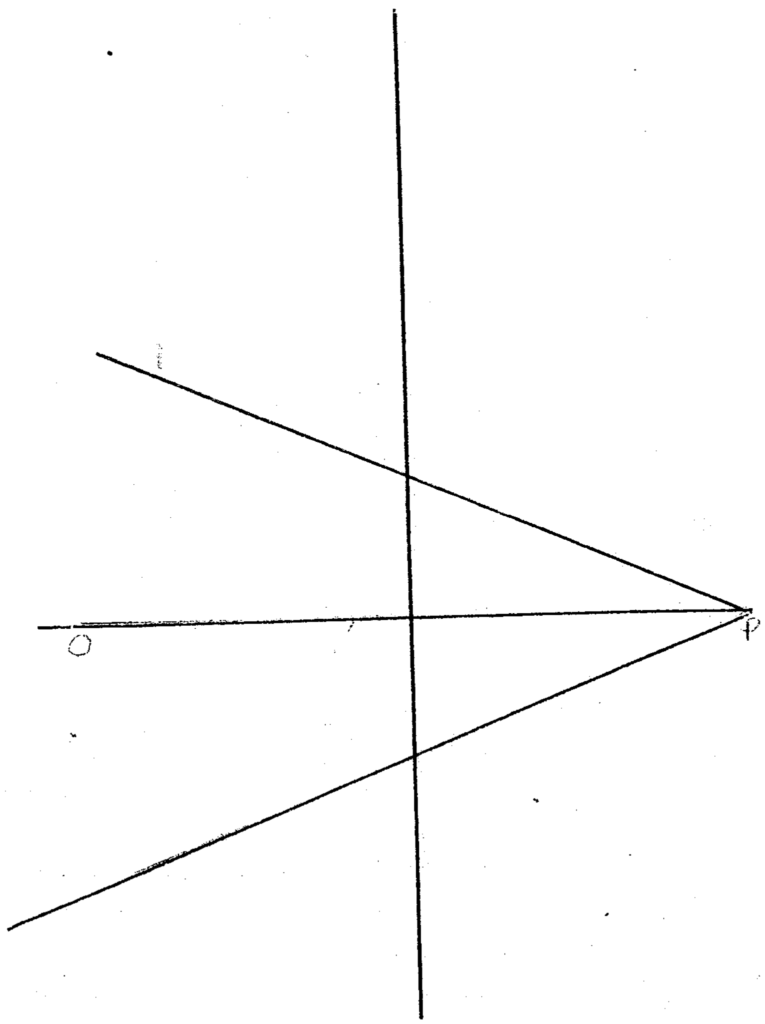
NOV 2008

Numb 6:



(b) Locus of points equidistant PR and PQ

11(a)(i) Area of trapezium = $\frac{1}{2}(AB + DC) \times 30$

$$\frac{1}{2}\times(65+DC)\times30 = 1575 \text{ cm}^2$$

$$(65+DC)\times15 = 1575$$

$$975 + 15DC = 1575$$

$$15DC = 1575 - 975$$

$$\frac{15DC}{15} = \frac{600}{15}$$

$$DC = 40$$

(ii) Volume of the block = 1575×150

$$= 236250\text{cm}^3$$

(iii) Density = $\frac{\text{mass}}{\text{volume}}$

mass = density × volume

$= 0{,}72\text{g/cm}^3 \times 23650\text{cm}^3$

$\therefore$ mass = 17028g

(iv) Total surface area = $1575\times2 + 150\times32{,}5\times2 + 65\times150\times2$

$= 3150 + 9750 + 19500 \text{ cm}^2$

$= 32400\text{cm}^2$

(b) $\frac{32400}{2000}$

= 16,2 litres of varnish required

$\therefore$ Number of tins = 4

2008 NOV

Candidate Name ....

Subject .... Paper ....

Question No 12

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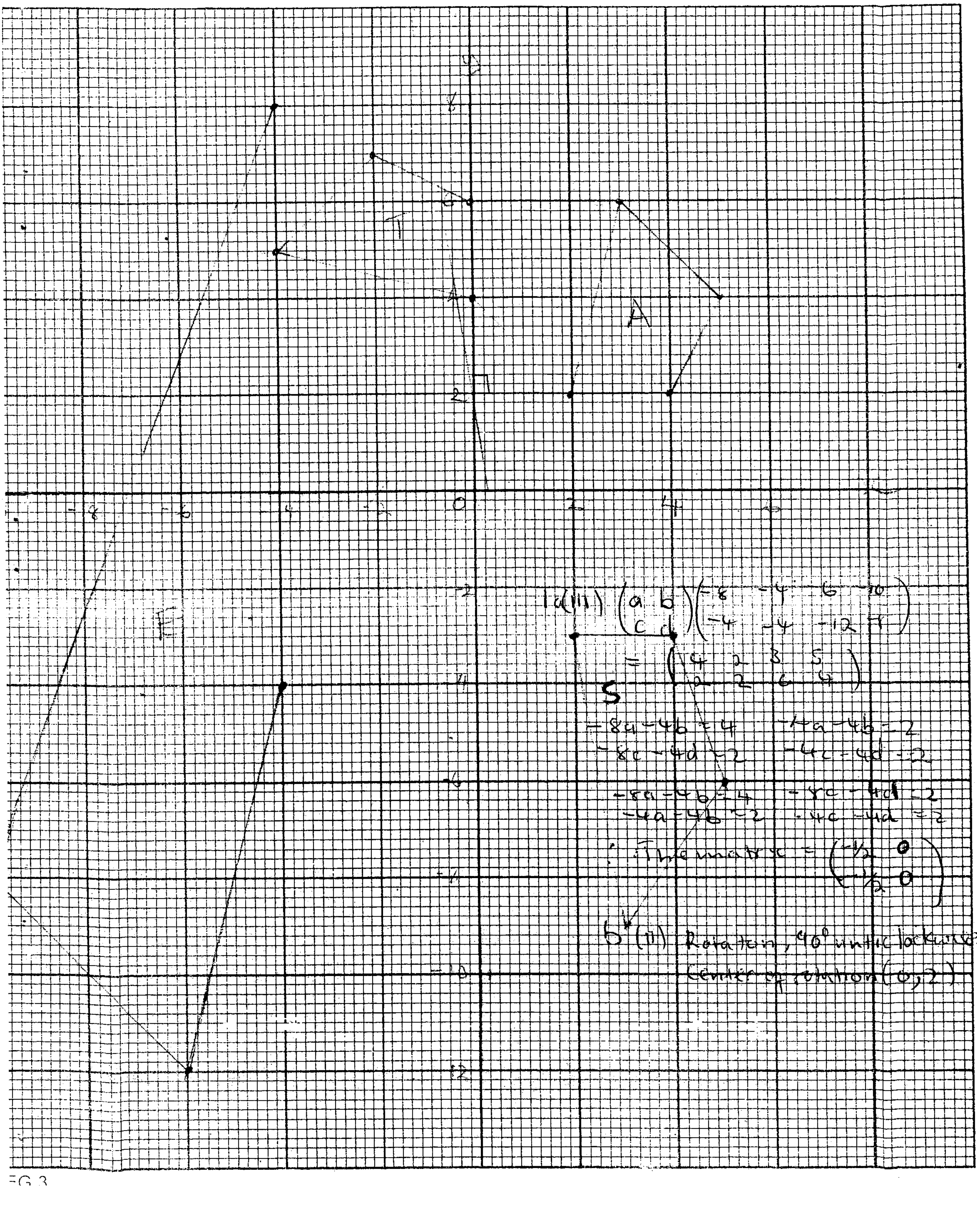
Centre Number | Candidate's Number



1a(iii) $\begin{pmatrix} a & b \\ c & d \end{pmatrix}\begin{pmatrix} -8 & -4 & 6 & -10 \\ -4 & -4 & -12 & -4 \end{pmatrix} = \begin{pmatrix} 4 & 2 & 3 & 5 \\ 2 & 2 & 6 & 4 \end{pmatrix}$

$-8a - 4b = 4 \qquad -4a - 4b = 2$

$-8c - 4d = 2 \qquad -4c - 4d = 2$

$-8a - 4b = 4 \qquad -8c - 4d = 2$

$-4a - 4b = 2 \qquad -4c - 4d = 2$

$\therefore$ The matrix $= \begin{pmatrix} -\frac{1}{2} & 0 \\ -\frac{1}{2} & 0 \end{pmatrix}$

b(ii) Rotation, 90° anticlockwise
Center of rotation $(0, 2)$

FG 3

NOV 2008

Candidate Name ....

Subject .... Paper ....

Question No 10

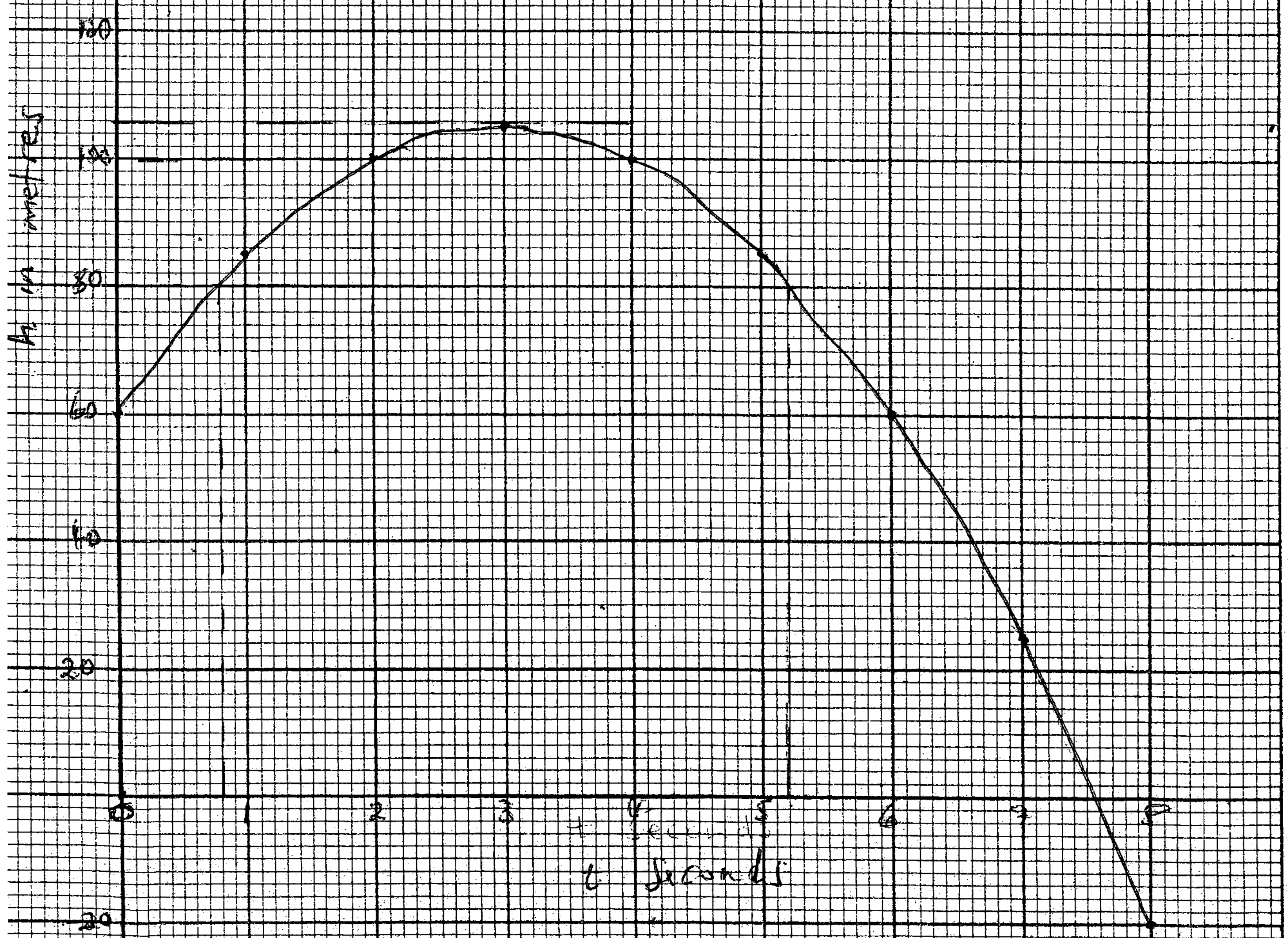
Centre Number	Candidate's Number

10 (a) $P = 105$ $q = 25$

c(i) maximum height = 104

(ii) V when t is 2 = 100

(iii) The time when the height is 80 m = 0,8 sec and 5,2 sec



FG 3

Candidate Name | Centre Number | Candidate Number

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL
General Certificate of Education Ordinary Level

MATHEMATICS 4008/1, 4028/1

PAPER 1

JUNE 2011 SESSION 2 hours 30 minutes

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

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.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.
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 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.

FOR EXAMINER'S USE

This question paper consists of 23 printed pages and 1 blank page.

[Turn over

2

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

F Exami U

1 Simplify $\dfrac{\frac{2}{3}+\frac{3}{4}}{1\frac{1}{6}}$.

Answer: ____________________ [3]

---

2 **(a)** Express the ratio 20 minutes : $1\frac{1}{3}$ hours, in its simplest form.

(b) Two partners, A and B, shared their profits from a business in the ratio 5 : 3.

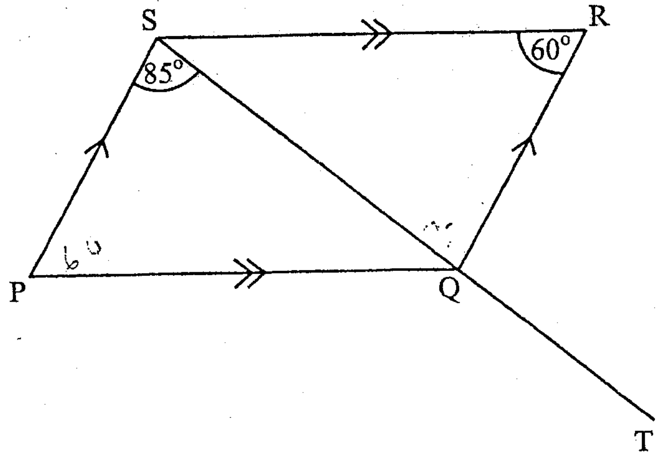
If B received \$4 800 000, calculate A's share.

Answer: *(a)* ____________________ [1]

(b) \$____________________ [2]

For Examiner's Use

3



In the diagram, PQRS is a parallelogram. $P\hat{S}Q = 85°$, $S\hat{R}Q = 60°$ and SQT is a straight line. Find

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

(b) $R\hat{S}Q$,

(c) $R\hat{Q}T$.

Answer: *(a)* $P\hat{Q}R$ = ______________________ [1]

(b) $R\hat{S}Q$ = ______________________ [1]

(c) $R\hat{Q}T$ = ______________________ [1]

Exar

4 The bearing of village P from village Q is 109°. Find

(a) the three figure bearing of Q from P,

(b) the compass bearing of Q from P.

Answer: *(a)* ______________________ [2]

(b) ______________________ [1]

5 (a) Solve $x - 3 \leq 3x + 10$.

(b) Given that x is an integer, write down the least value of x for which $x - 3 \leq 3x + 10$.

Answer: *(a)* ______________________ [2]

(b) $x =$ ______________________ [1]

For Examiner's Use

6 Make u the subject of the formula $T = \frac{mu^2}{K} - 5mg$.

Answer: $u =$ ______________________ [3]

7 Express $5^2 + 3 \times 5 + 4$ as a number in

(a) base 5,

(b) base 8.

Answer: (a) ______________________ [1]

(b) ______________________ [2]

Exam... (cut-off margin text: "For Examiner's Use")

8 **(a)** State the order of rotational symmetry of a parallelogram.

(b) The triangle XYZ has XY = 5 cm and YZ = 6 cm.

Given that the triangle XYZ has only one line of symmetry, write down the two possible lengths of XZ.

Answer: *(a)* ______________________ [1]

(b) ________ cm or ________ cm [2]

---

9 A rectangle measures 10,2 cm by 7,1 cm, correct to one decimal place.

Find the minimum possible perimeter of the rectangle.

Answer: ______________________ cm [3]

For Examiner's Use

10 **(a)** A car uses l litres of petrol for every d kilometres travelled.

State the type of variation between l and d.

(b) Given that the car uses 5 litres to cover 60 kilometres, find the equation connecting l and d.

Answer: *(a)* ____________________ [1]

(b) ____________________ [2]

---

11 Evaluate

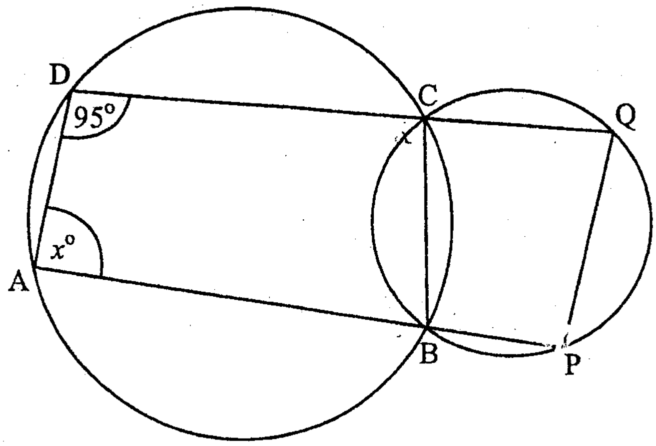
(a) $3m^{-5} \times 2m^{5}$,

(b) $\left(\frac{4}{9}\right)^{-\frac{1}{2}}$.

Answer: *(a)* ____________________ [1]

(b) ____________________ [2]

12



In the diagram, ABCD and PBCQ are intersecting circles. DCQ and ABP are straight lines.

(a) Given that $A\hat{D}C = 95°$, calculate

(i) $A\hat{B}C$,

(ii) $P\hat{Q}C$.

(b) Given also that $D\hat{A}B = x°$, find an expression for $B\hat{P}Q$ in terms of x.

Answer: *(a)* *(i)* $A\hat{B}C =$ ____________ [1]

(ii) $P\hat{Q}C =$ ____________ [1]

(b) $B\hat{P}Q =$ ________________ [1]

For Examiner's Use

10 **(a)** A car uses l litres of petrol for every d kilometres travelled.

State the type of variation between l and d.

(b) Given that the car uses 5 litres to cover 60 kilometres, find the equation connecting l and d.

Answer: *(a)* ______________________ [1]

(b) ______________________ [2]

11 Evaluate

(a) $3m^{-5} \times 2m^{5}$,

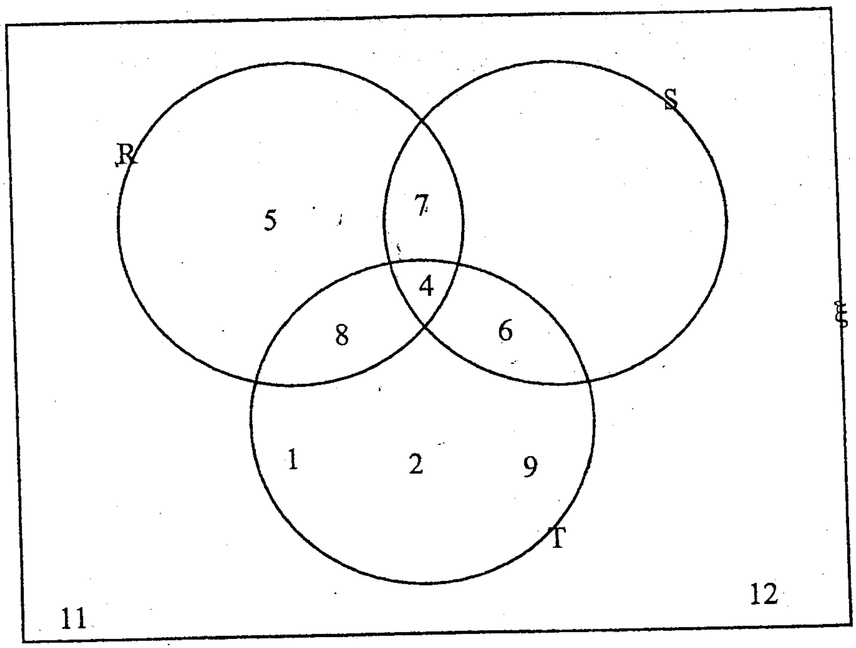
(b) $\left(\frac{4}{9}\right)^{-\frac{1}{2}}$.

Answer: *(a)* ______________________ [1]

(b) ______________________ [2]

For Examiner's Use

13



In the Venn diagram, R, S, T and ξ are sets with their elements as shown.

Use the Venn diagram to find

(a) $R' \cap S$,

(b) $(R \cap S) \cup (R \cap T)$,

(c) $n(R \cup S \cup T)'$.

Answer: *(a)* ______________________ [1]

(b) ______________________ [1]

(c) ______________________ [1]

For Examiner's Use

14 Express $\log_{10} x + 2\log_{10} y = 1$ as an equation in index form.

Answer: ______________________ [3]

---

15 It is given that $\mathbf{p} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$, $\mathbf{q} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$ and $\mathbf{r} = \begin{pmatrix} m \\ n \end{pmatrix}$.

(a) Express $\mathbf{p} - 3\mathbf{q}$ as a column vector.

(b) Given that $\mathbf{p} + \mathbf{q} = 3\mathbf{r}$, find the value of m and the value of n.

Answer: *(a)* ______________________ [1]

(b) $m =$ ______________________

$n =$ ______________________ [2]

For Examiner's Use

16 (a) Convert

(i) the fraction $\frac{3}{8}$ to a percentage,

(ii) 9% to a decimal fraction.

(b) Simplify the expression $\sqrt{3}+\sqrt{12}$.

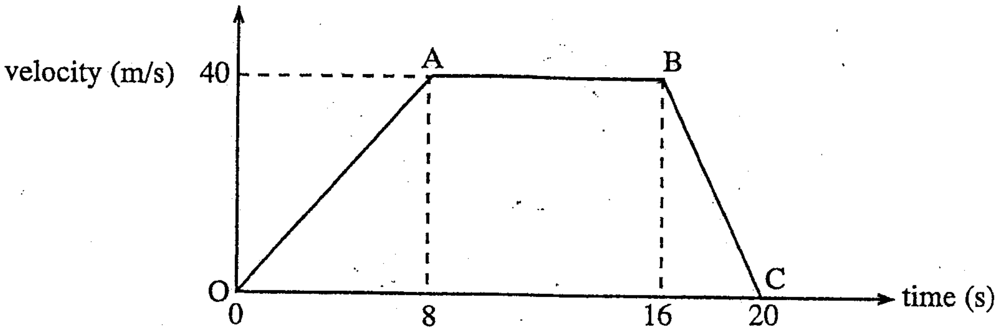
Answer: *(a)* *(i)* ______________% [1]

(ii) ______________ [1]

(b) ______________ [2]

For Examiner's Use

17



In the diagram, O, A, B and C are four points on the velocity-time graph of an object.

(a) Describe the motion of the object as illustrated on the section of the graph.

(i) O to A,

(ii) A to B.

(b) Calculate the distance covered by the object during the 20 seconds.

Answer:

(a) *(i)* ______________________________

______________________________ [1]

(ii) ______________________________

______________________________ [1]

(b) ______________________ metres [2]

For Examiner's Use

18 The following entries show the number of bicycles sold per day in nine days.

6; 10; 12; 9; 14; 10; 15; 10; 12

Find

(a) the mode,

(b) the median,

(c) the next entry if the new mean on the tenth day is 12.

Answer: (a) ______________________ [1]

(b) ______________________ [1]

(c) ______________________ [2]

For Examiner's Use

19 (a) Expand and simplify $(3x+2y)(2x-y)$.

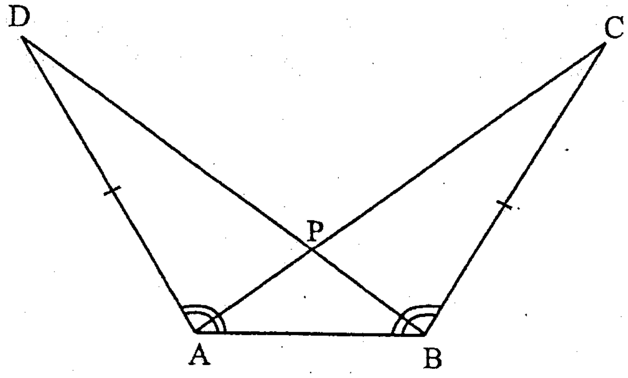
(b) Factorise completely $20x^2-5y^2$.

Answer: (a) ______________________ [2]

(b) ______________________ [2]

For Examiner's Use

20 **(a)**



In the diagram, $D\hat{A}B = A\hat{B}C$, $AD = BC$ and AC and BD intersect at P.

(i) Name the triangle that is congruent to triangle ABC.

(ii) State the case for congruency in **(a)(i)**.

(b) The sides of a triangle X are 9 cm, 7 cm and 6 cm. The shortest side of a triangle Y, which is similar to triangle X, is 3 cm.

Write down the ratio, area of X : area of Y.

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

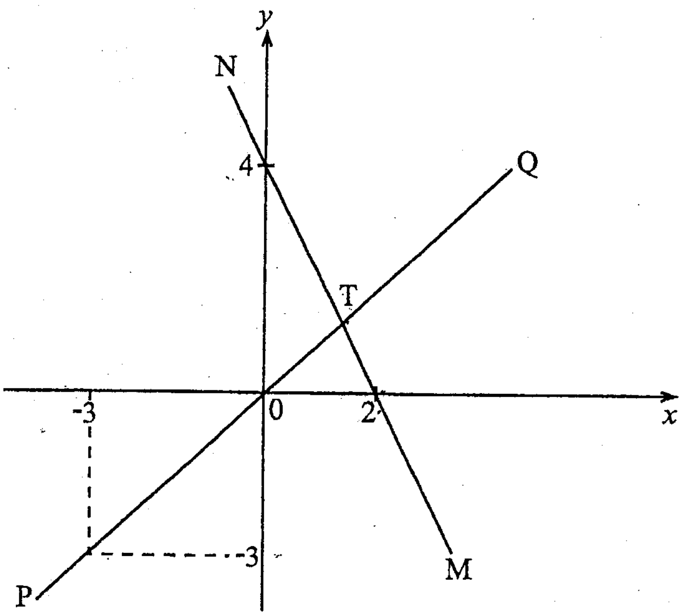
(ii) ______________

____

______________ [1]

(b) ______________ [2]

21



In the diagram, PQ and MN are two straight lines which intersect at T.

(a) Find the equation of the line

(i) PQ,

(ii) MN.

(b) Calculate the coordinates of the point T.

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

(ii) ________________ [2]

(b) (;) [2]

22 The following is an extract from Mrs Green's telephone Bill for the period 01/03/06 to 31/03/06.

	$
Rental	2 000
177 units at X cents/unit	7 965
Sub-Total	9 965
VAT at 15%	Y
Amount due	Z

Calculate

(a) X,

(b) Y,

(c) Z.

Answer: (a) $X =$ ____________________ [2]

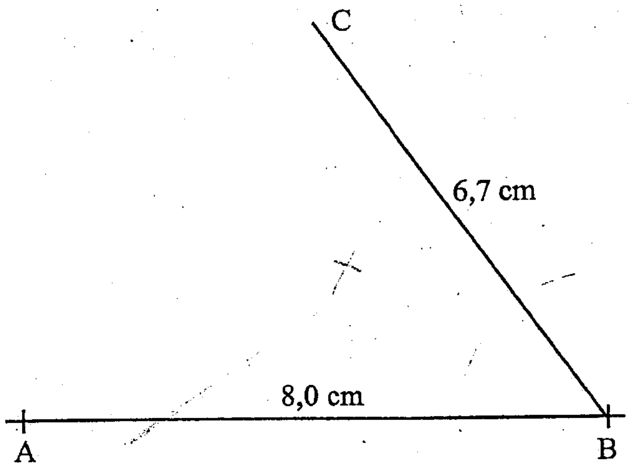
(b) $Y =$ ____________________ [2]

(c) $Z =$ ____________________ [1]

For Examiner's Use

For Examiner's Use

23



In the diagram, AB and CB are intersecting straight lines.

Use ruler and compasses only to construct on the diagram

(a) **(i)** the perpendicular bisector of BC,

(ii) a line on the same side of AB as C and is also 2,0 cm from AB.

(b) Mark the point X which is 2,0 cm from AB and equidistant from B and C.

Answer:	*(a)*	*(i)*	on the diagram	[2]
		(ii)	on the diagram	[2]
	(b)	on the diagram		[1]

For Examiner's Use

24 **(a)** Solve the equation $\frac{2}{x+2}=\frac{1}{3}$.

(b) Given that $f(x)=x^2+x$, find

(i) $f(3)$,

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

Answer: *(a)* $x =$ ____________________ [1]

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

(ii) ________ or ______ [2]

[Turn over

25 When a biased coin is tossed, the probability of getting a head is 0,6. For this coin, find

(a) the probability of getting a tail if it is tossed once,

(b) the probability of getting at least one head if it is tossed twice,

(c) the expected number of heads if it is tossed 50 times.

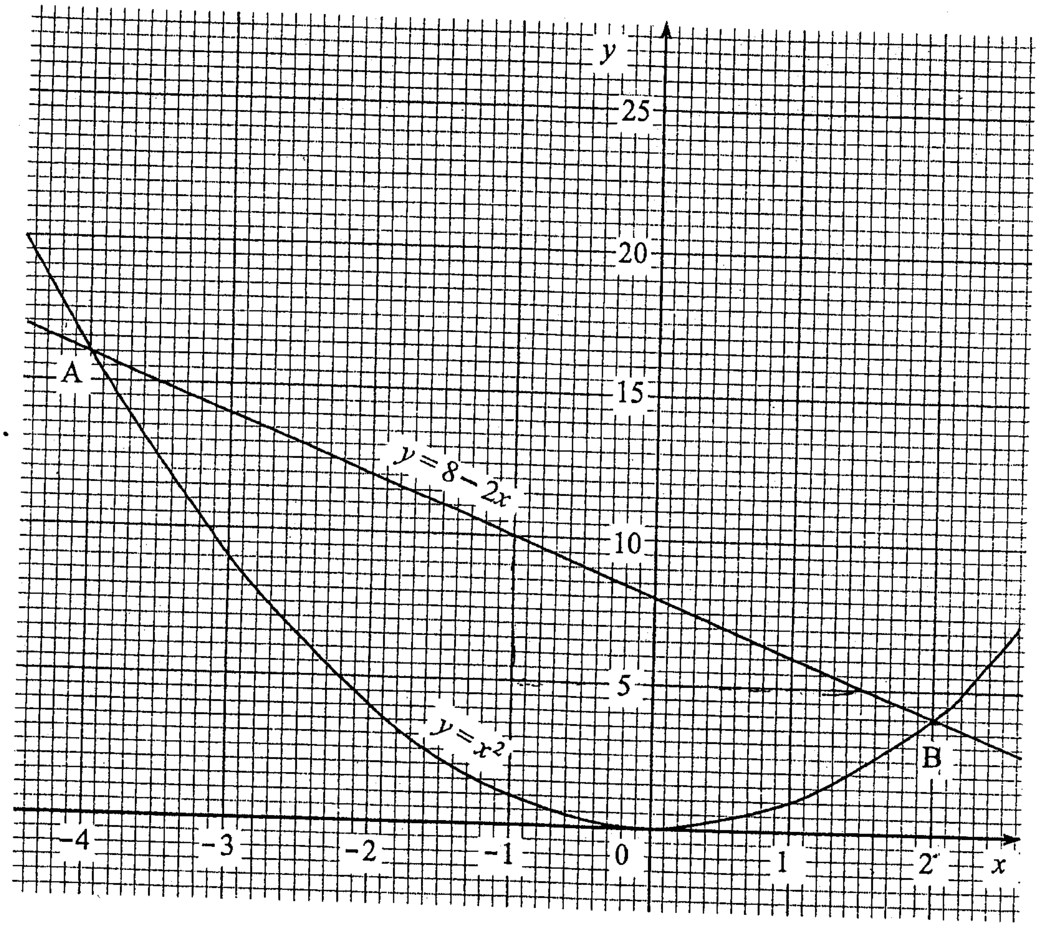
Answer: *(a)* ____________________ [1]

(b) ____________________ [2]

(c) ____________________ [2]

For Examiner's Use

26



In the diagram, the curve $y = x^2$ and the line $y = 8 - 2x$ intersect at A and at B.

(a) Write down

(i) the gradient of the line $y = 8 - 2x$,

(ii) the equation of the line passing through the origin and parallel to the line $y = 8 - 2x$.

For Examiner's Use

(b) Write down the x- coordinate of

(i) A,

(ii) B.

(c) Write down an equation in x whose roots are your answers in **(b)**.

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

(ii) ______________ [1]

(b) *(i)* at A $x =$ ________ [1]

(ii) at B $x =$ ________ [1]

(c) ____________________ [1]

For Examiner's Use

27 **In this question take π to be 3,14.**

A spherical ball is 20 centimetres in diameter. Calculate

(a) the surface area of the ball,

(b) the volume of the ball, correct to the nearest whole number.

$$\begin{bmatrix} \text{Surface area} = 4\pi r^2 \\ \text{Volume} = \dfrac{4}{3}\pi r^3 \end{bmatrix}$$

Answer: *(a)* ______________ cm^2 [2]

(b) ______________ cm^3 [3]

JUNE 2011

1 (a) $\dfrac{{}^{2}/_{3} + {}^{3}/_{4}}{1{}^{1}/_{6}}$

$$\dfrac{\dfrac{4(2) + 3(3)}{12}}{\dfrac{7}{6}}$$

$$\dfrac{\dfrac{8 + 9}{12}}{\dfrac{7}{6}}$$

$$\frac{17}{12} \div \frac{7}{6}$$

$$\frac{17}{12} \times \frac{6}{7}$$

$1{}^{3}/_{14}$

2 (a) 20 minutes : $1{}^{1}/_{3}$ hours

20 : 80

1 : 4

(b) $\dfrac{4\,800\,000}{3} \times 5$

= $8 000 000

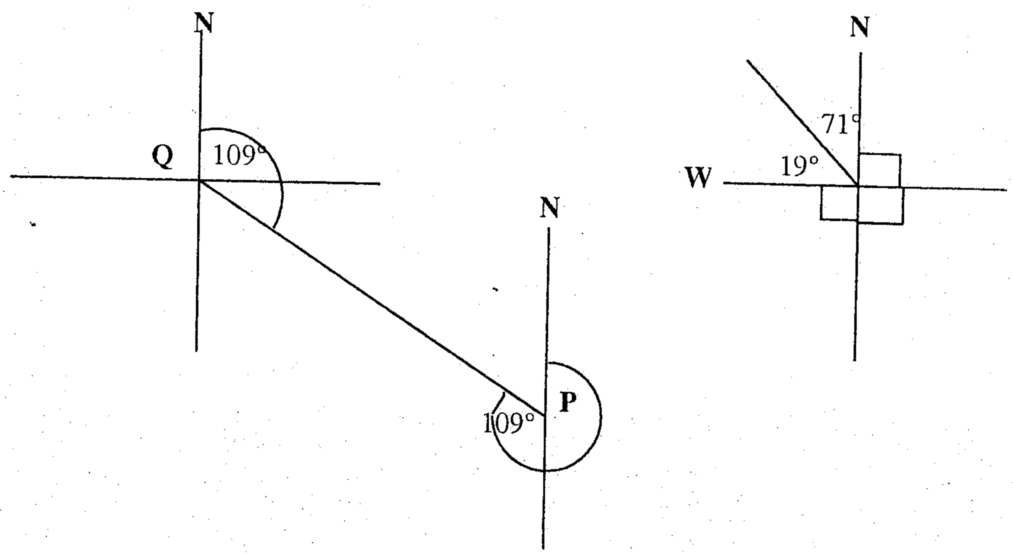
3 (a) PQR = 35 + 85

= 120°

(b) RSQ = 35°

(c) RQT = 95°

4



(a) 180 + 109 = 289°

(b) N71°W

2.b

5 (a) $x - 3 \leq 3x + 10$

$-3 - 10 \leq 3x - x$

$\dfrac{-13}{2} \leq \dfrac{2x}{2}$

$-6\tfrac{1}{2} \leq x$

(b) $x = -6$

6 $T = \dfrac{mu^2}{k} - 5mg$

$T + 5mg = \dfrac{mu^2}{k}$

$\dfrac{kT + 5kmg}{m} = \dfrac{mu^2}{m}$

$\sqrt{\dfrac{kT + 5kmg}{m}} = u$

$\sqrt{\dfrac{kT}{m} + 5kg} = u$

7 (a) $5^2 + 3\times5 + 4 = 1\times5^2 + 3\times5^1 + 4\times5^0$

$= 134_5$

$(25 + 15 + 4)_{10} = 44_{10}$

$$\begin{array}{c|l}
5 & 44 \\ \hline
5 & 8 \text{ r } 4 \\
5 & 1 \text{ r } 3 \\
 & 0 \text{ r } 1
\end{array} \uparrow$$

$= 134_5$

7 (b)

$$\begin{array}{c|l}
8 & 44 \\ \hline
8 & 5 \text{ r } 4 \\
 & 0 \text{ r } 5
\end{array}$$

$= 54_8$

8 (a) 2 **(b)** 5cm and 6cm

9 (10,15 + 7,05)2 cm
= 34,4cm

10 (a) direct variation

(b) $l = kd$

$\dfrac{5}{60} = \dfrac{60k}{60}$

$\dfrac{1}{12} = k$

$\therefore$ equation is $l = {}^1/_{12}\mathbf{k}$

11 (a) $3m^{-5} \times 2m^5$

$= 6m^{-5+5}$

$= 6m^0$

$= 6$

(b) $\left[\dfrac{4}{9}\right]^{-½}$

$\sqrt[2]{\dfrac{9}{4}}$

$= \dfrac{3}{2}$

$= 1½$

12 (i) ABC = 85° opp angles of a cyclic quad. **(ii)** PQC = 85° opp exterior angle of a cyclic quad is = opp interior angle. **(b)** BPQ = BCD = $180 - x$ ∴ BPQ = $180 - x$ opp exterior angle of a cyclic quad is = opp interior angle.	**13 (a)** $R' \cap S = \{6\}$ **(b)** $(R \cap S) \cup (R \cap T) = \{4, 7, 8\}$ **(c)** $n(R \cup S \cup T)' = 2$
14 $\log_{10}x + 2\log_{10}y = 1$ $\log_{10}x + y^2 = \log_{10}10$ $\log_{10}xy^2 = \log_{10}10$ $xy^2 = 10$	**15 (a)** $\mathbf{p} - 3\mathbf{q} = \begin{bmatrix} 6 \\ -8 \end{bmatrix} - 3\begin{bmatrix} 3 \\ 5 \end{bmatrix}$ $= \begin{bmatrix} 6 \\ -8 \end{bmatrix} - \begin{bmatrix} 9 \\ 15 \end{bmatrix}$ $= \begin{bmatrix} -3 \\ 23 \end{bmatrix}$ **(b)** $p + q = 3r$ $\begin{bmatrix} 6 \\ -8 \end{bmatrix} + \begin{bmatrix} 3 \\ 5 \end{bmatrix} = 3\begin{bmatrix} m \\ n \end{bmatrix}$ $\begin{bmatrix} 9 \\ -3 \end{bmatrix} = \begin{bmatrix} 3m \\ 3n \end{bmatrix}$ $m = 3$ $n = -1$
16 (a) (i) $\frac{3}{8} \times 100$ $= 37.5\%$ **(ii)** $\frac{9}{100}$ $= 0.09$	**16 (b)** $\sqrt{3} + \sqrt{(4 \times 3)}$ $\sqrt{3} + 2\sqrt{3}$ $3\sqrt{3}$
17 (a) O to A => The object is moving at a constant acceleration **(b)** A to B => The object is moving at a constant velocity **(c)** Distance = Area under the graph $= \frac{1}{2}(8+20) \times 40$ $= \frac{1}{2} \times 28 \times 40$ $= 14 \times 40$ $= 560\text{m}$	**18 (a)** Mode = 10 **(b)** 6, 9, 10, 10, 10, 12, 14, 15 ∴ Median = 10 **(c)** $\frac{6+9+10+10+10+12+14+15+n}{10} = 12$ $\frac{98 + n}{10} = 12$ $98 + n = 120$ $n = 120 - 98$ $n = 22$

19 (a) $(3x + 2y)(2x - y)$

$6x^2 - 3xy + 4xy - 2y^2$

$6x^2 + xy - 2y^2$

(b) $20x^2 - 5y^2$

$5(4x^2 - y^2)$

$5(2x + y)(2x - y)$

20 (a) ABC = BAD

(b) Side angle side

(c) Shortest side in triangle $x = 6\text{cm}$

ratio of side $= 3 : 6$

$1 : 2$

$x : y = 2^2 : 1^2$

$= 4 : 1$

21 (a) PQ = $y = x$

equation of line => $y = mx + c$

$y = 1x + 0$

$y = x$

MN = $-2x + 4$ gradient of MN $= \frac{4}{-2}$

$= -2$

21 (b) $x = -2x + 4$

$\frac{3x}{3} = \frac{4}{3}$

$x = {}^4/_3$

$\therefore T = ({}^4/_3; {}^4/_3)$

22 (a) $\frac{7965}{177}$

$= 45$

(b) $Y = \frac{15}{100} \times 7965$

$= 1194\frac{3}{4}$

(c) Z = 9965

+ 1194,75

11159,75

24 (a) $\frac{2}{x+2} = \frac{1}{3}$

$6 = x + 2$

$6 - 2 = x$

$4 = x$

(b) $+ (3) = 3^2 + 3$

$= 9 + 3$

$= 12$

(c) $x^2 + x = 0$

$x(x + 1) = 0$

$x = 0$ or -1

25 (a) 0,4 or ${}^4/_{10} = {}^1/_5$

(b) P (h , t) or P (t , h)

${}^6/_{10} \times {}^4/_{10} + {}^4/_{10} \times {}^6/_{10}$

${}^{24}/_{100} + {}^{24}/_{100}$

$= {}^{48}/_{100}$

$= \frac{12}{25}$

(c) $\frac{6}{10} \times 50$

$= 30$

26 (**a**) Gradient = $\dfrac{\text{increase in } y}{\text{increase in } x}$ (**i**) $= \dfrac{5}{-2,5}$ $= \dfrac{50}{-25}$ $= -2$ (**ii**) $y = -2x$	(**b**) (**i**) $Ax = -4$ $Bx = 2$ (**c**) $x^2 = 8 - 2x$ $x^2 + 2x - 8 = 0$
27 (**a**) $A = 4\pi r^2$ $= 4 \times \dfrac{22}{7} \times 100\ (10^2)$ $= 1257\,{}^1/_7\ cm^2$	(**b**) $V = {}^4/_3\pi r^3$ $= {}^4/_3 \times {}^{22}/_7 \times 10 \times 10 \times 10$ $= {}^4/_3 \times {}^{22}/_7 \times 1000$ $= 4190\,{}^{10}/_{25}$ $= 4190 cm^3$

117

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For Performance Measurement

ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

General Certificate of Education Ordinary Level

MATHEMATICS

PAPER 2

4028/2

NOVEMBER 2010 SESSION 2 hours 30 minutes

Additional materials:
- Answer paper
- Geometrical instruments
- Graph paper (3 sheets)
- Mathematical tables
- Plain paper (1 sheet)

TIME 2 hours 30 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces provided on the answer paper/answer booklet.

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

Write your answers on the separate answer paper provided.
If you use more than one sheet of paper, fasten the sheets together.

All working must be clearly shown. It should be done on the same sheet as the rest of the answer.
Omission of essential working will result in loss of marks.
If the degree of accuracy is not specified in the question and if the answer is not exact, the answer should be given to three significant figures. Answers in degrees should be given 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 calculator may be used to evaluate explicit numerical expressions.

This question paper consists of 12 printed pages.

[Turn over

118

Section A [64 marks]

Answer all questions in this section.

1 (a) Find the value of $\frac{1}{3}+1\frac{7}{9}\div 2\frac{2}{3}$. [3]

(b) During a sale, the price of a camera was reduced from \$160 to \$148,80.

Calculate the percentage decrease in price. [3]

(c) Given that $f(x)=x^2-4x+3$, find all the values of x for which $f(x)=0$. [4]

---

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

Hence or otherwise, solve the equation

$$\frac{1}{x-1}+\frac{2}{x+1}=\frac{3}{x}.$$ [4]

(b) Solve the inequality

$y-4<3y+2\leq 6-y$.

Hence list the integral values of y that satisfy the inequality. [4]

(c) In an Olympiad test, there were 26 questions. Eight points were given for each correct answer and five points were deducted for each wrong answer.

Tamara answered all questions and scored zero. Find the number of questions she had got correct. [4]

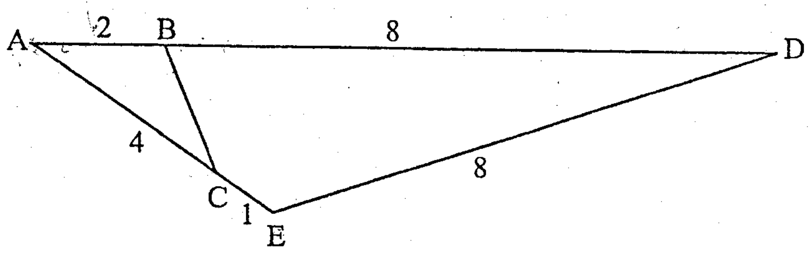
119

3 (a) It is given that $s = ut - \frac{1}{2}gt^2$.

(i) Find the value of s if $g = 9{,}8$; $u = 20$ and $t = 2$.

(ii) Make g the subject of the formula. [5]

(b)



In the diagram, ADE is a triangle, B is a point on AD such that AB = 2 cm and BD = 8 cm. C is a point on AE such that AC = 4 cm and CE = 1 cm, DE = 8 cm.

(i) Name the triangle that is similar to Δ ABC.

(ii) Calculate the length of BC. [4]

---

4 (a) It is given that P varies directly as T and inversely as V.

(i) Write down an equation connecting P, V, T and a constant k.

(ii) Given that $P = 2 \times 10^5$ when $V = 1 \times 10^{-3}$ and $T = 300$, calculate the value of k.

C h

(iii) Calculate P if V = 0,0025 and T = 300. [5]

(b) Given that $\mathbf{M} = \begin{pmatrix} 3 & -2 \\ -1 & 4 \end{pmatrix}$, $\mathbf{N} = \begin{pmatrix} 5 \\ 7 \end{pmatrix}$ and $\mathbf{R} = \begin{pmatrix} 3 & -1 \end{pmatrix}$,

find (i) **MN**

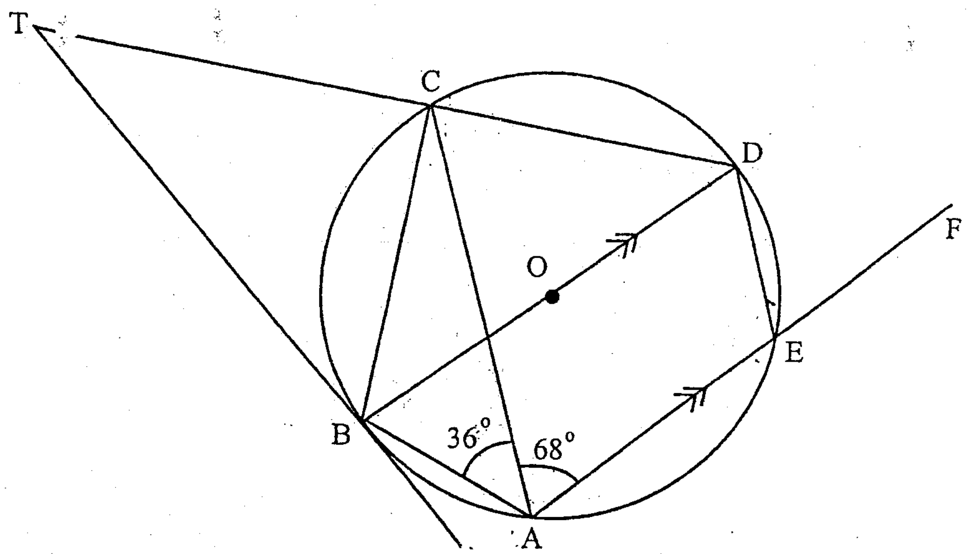
(ii) $\mathbf{M}^{-1}$

(iii) **RN**. [6]

[Turn over

120

5 (a)



In the diagram, A, B, C, D and E are points on the circumference of a circle centre O. BT is a tangent to the circle and TCD and AEF are straight lines. $C\hat{A}E = 68^{\circ}$, $C\hat{A}B = 36^{\circ}$ and BD is parallel to AE.

Find the size of

(i) $C\hat{B}O$,

(ii) $B\hat{T}C$,

(iii) $D\hat{E}F$,

(iv) $A\hat{C}B$. [6]

(b) In a recipe for an apple pie, 500 g of apples and 200 g of flour are needed in making an apple pie for 4 people.

(i) If an apple pie was to be made for 6 people, calculate the quantity of apples needed.

(ii) If the apple pie was to be made for 3 people, calculate the quantity of flour needed. [4]

Answer the whole of this question on a sheet of plain paper.

Use ruler and compasses only and show all construction lines and arcs.

All constructions must be done on a single diagram.

6 A farmer has a plot in the shape of a quadrilateral ABCD, in which AB = 110 m, BC = 100 m, CD = 60 m, AD = 70 m and $A\hat{B}C = 60°$.

(a) Using a scale of 1cm:10 m, construct the quadrilateral ABCD. [5]

(b) Draw the locus of points

(i) 30 m from AB,

(ii) equidistant from A and B,

(iii) inside the quadrilateral which are 60 m from B. [5]

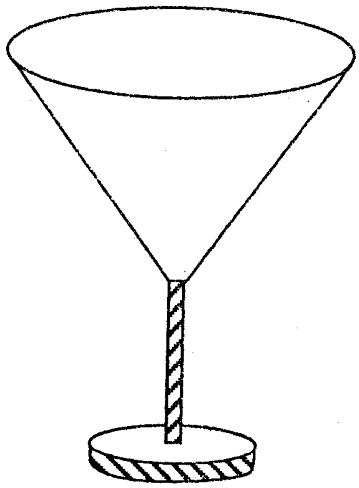
(c) The farmer wishes to dig a well inside the plot such that it is at least 30 m from AB, at least 60 m from B and nearer to A than to B.

Shade the region in which the well must be. [2]

SECTION B [36 marks]

Answer three questions in this section

7 (a)



The diagram shows a wine glass in the shape of a cone mounted on a stand. The depth of the cone is equal to its diameter at the top.

(i) Write down an expression for the volume of the cone in terms of its radius r and π.

(ii) If the wine glass can hold 20 ml of wine when full, calculate the radius of the wine glass at the top.

(iii) Wine is bought in bottles of volume 750 ml. Calculate the number of wine glasses that can be filled from one bottle. [5]

[Volume of cone = $\frac{1}{3}$ base area x height. $\pi = \frac{22}{7}$]

(b) The base of a triangle is x cm and its height is $(x-7)$ cm.

(i) Write down an expression for the area of the triangle.

(ii) If the area of the triangle is 6 cm^2, form an equation in x and show that it reduces to $x^2 - 7x - 12 = 0$. [3]

(c) Solve the equation $x^2 - 7x - 12 = 0$, giving your answers correct to 2 decimal places. [4]

123

Answer the whole of this question on a sheet of graph paper.

8 The following is a table of values for the graph of the function

$y = 7 - 5x - x^2$

x	-7	-6	-5	-4	-3	-2	-1	0	1	2
y	-7	1	7	11	13	13	11	7	1	-7

(a) Using a scale of 2 cm to represent 1 unit on the horizontal axis and 2 cm to represent 5 units on the vertical axis, draw the graph of the function $y = 7 - 5x - x^2$ *for* $-7 \leq x \leq 2$. [4]

(b) Use your graph to answer the following questions.

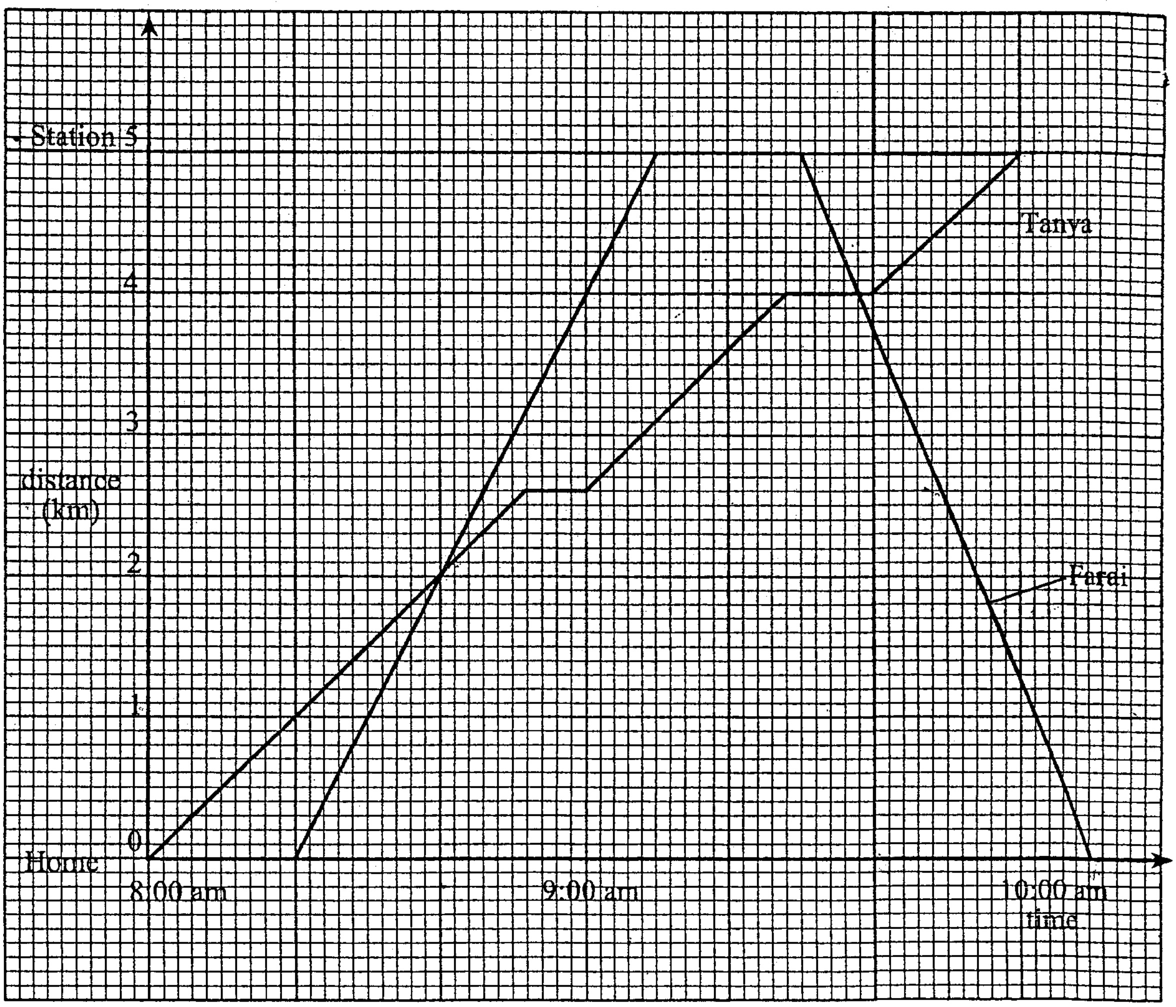
(i) State the maximum value of the function $y = 7 - 5x - x^2$.

(ii) Solve the equation $7 - 5x - x^2 = 0$.

(iii) Solve the equation $-5x - x^2 = 2$.

(iv) Find the gradient of the curve at the point where $x = 0$. [8]

9 (a) The diagram shows the distance-time graph of a cyclist, Farai and a pedestrian, Tanya, who travelled from their home to the train station which was 5 km away. After sometime Farai came back home.



Use the diagram to answer the following questions.

(i) Find Farai's speed on the outward journey. [2]

(ii) State 1. the time when, Tanya arrived at the station,

2. the time when Farai overtook Tanya on the way to the station,

3. the distance that Tanya had covered when she was overtaken,

4. the total time that Farai was resting,

5. the distance that Tanya had left to cover when Farai met her the second time. [5]

(iii) Calculate Tanya's average speed for the whole journey. [2]

(b) Two cards were picked at random from a pack of 52 playing cards **with** replacement.

Find the probability that one was a Court card (i.e. J, K or Q) and the other was an Ace (A). [3]

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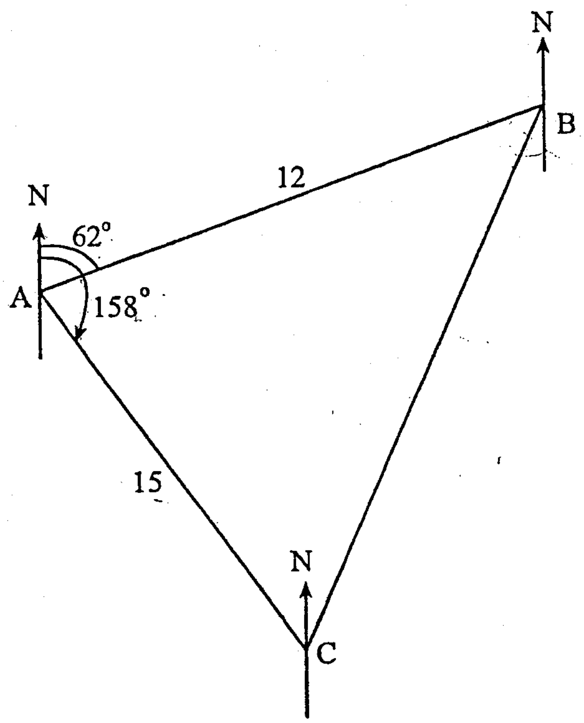
10



In the diagram, A, B and C are three points on level ground.
B is 12 km from A on a bearing of 062° and C is 15 km from A on a bearing of 158°.

Calculate (i) the distance from B to C, [5]

(ii) $A\hat{C}B$ to the nearest degree, [3]

(iii) the bearing of C from B. [4]

Answer the whole of this question on a sheet of graph paper.

12 The vertices of Δ PQR are P(3; 1), Q(4; 1) and R(4; 3).

(a) Taking 2 cm to represent one unit on both axes, draw the x and y axes for $-3 \le x \le 5$ *and* $-6 \le y \le 5$. Draw and label Δ PQR. [1]

(b) A certain transformation maps Δ PQR onto $\Delta\, P_1Q_1R_1$ where $P_1(-2; -3)$, $Q_1(-1; -3)$ and $R_1(-1; -1)$.

(i) Draw and label $\Delta\, P_1Q_1R_1$.

(ii) Describe completely the **single** transformation which maps Δ PQR onto $\Delta\, P_1Q_1R_1$. [3]

(c) $\Delta\, P_2Q_2R_2$ is the image of Δ PQR under a reflection in the line $y = x$. Draw and label $\Delta\, P_2Q_2R_2$. [3]

(d) Δ PQR is enlarged with centre (0; 1) and scale factor $-\frac{1}{2}$ onto $\Delta\, P_3Q_3R_3$.

Draw and label $\Delta\, P_3Q_3R_3$. [3]

(e) A stretch represented by the matrix $\begin{pmatrix} 1 & 0 \\ 0 & -2 \end{pmatrix}$ maps Δ PQR onto $\Delta\, P_4Q_4R_4$.

Draw and label $\Delta\, P_4Q_4R_4$. [2]

128

Answer the whole of this question on a sheet of graph paper.

11 A builder wishes to build houses and flats on 6 000 m^2 plot of land.

(a) The City Council insists that there must be more than 6 houses and that there must be more flats than houses.

Taking x to represent the number of houses and y to represent the number of flats, write down two inequalities, other than $x > 0$ and $y > 0$, which satisfy these conditions. [2]

(b) The builder allows 300 m^2 for each flat and 400 m^2 for each house. Write down another inequality which satisfies this condition and show that it reduces to $4x + 3y \leq 60$. [1]

(c) The point $(x; y)$ represents x houses and y flats. Using a scale of 2 cm to represent 5 units on both axes, draw the x and y axes for $0 \leq x \leq 20$ *and* $0 \leq y \leq 20$.

Construct and show by shading **the unwanted** regions, the region in which $(x ; y)$ must lie. [5]

(d) Use your graph to find

(i) the maximum number of flats that can be built,

(ii) the maximum number of houses that can be built,

(iii) the values of x and y which give the maximum number of dwelling units. [4]