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MATHEMATICS

PAPER 1 (CORE/EXTENDED) 3815/1

Monday **19 MAY 2014** 1:00 P.M.–2:30 P.M.

Additional materials:
Calculator (not graphing)
Geometrical instruments

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS TO CANDIDATES

Do not open this booklet until you are told to do so.

Write your school number, candidate number, surname and initials in the spaces provided at the top of this page.

Answer **ALL** questions in the spaces provided for each question.

ALL working must be shown.

ALL working must be done in blue or black ink, except for drawings, lines and constructions which may be done in pencil.

INFORMATION FOR CANDIDATES

Calculators [**NOT GRAPHING CALCULATORS**] may be used.

Tracing paper may be used.

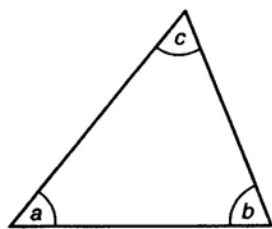
Geometrical instruments are required.

The mark for each question, or part question, is shown in brackets [].

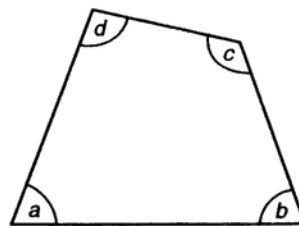
The total number of marks for this paper is 100.

This question paper consists of 15 printed pages and 1 blank page.

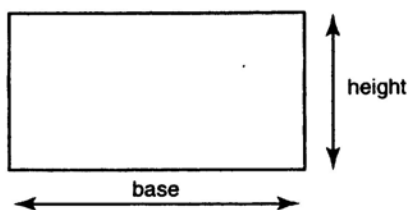
INFORMATION AND FORMULAE



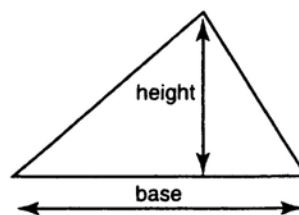
Angle sum of triangle
 $a + b + c = 180^\circ$



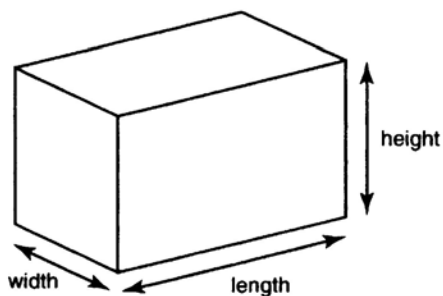
Angle sum of quadrilateral
 $a + b + c + d = 360^\circ$



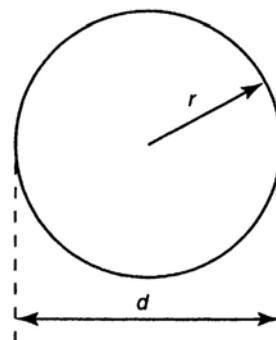
Area of rectangle = base $\times$ height



Area of triangle = $\frac{\text{base} \times \text{height}}{2}$

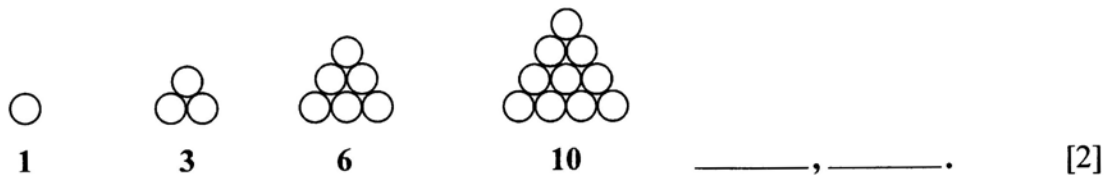


Volume of cuboid = length $\times$ width $\times$ height



Circumference of circle = $2\pi r$ or πd
 Area of circle = πr^2

1. Triangular numbers follow the pattern as shown. Write down the next **TWO** triangular numbers.



2. The prime number 17, when its digits are reversed, is also a prime number. List **THREE** other prime numbers, less than 50, that have this same property.

Answer: _____ [3]

3. Convert

(a) 0.36 to a fraction in lowest terms,

Answer: _____ [1]

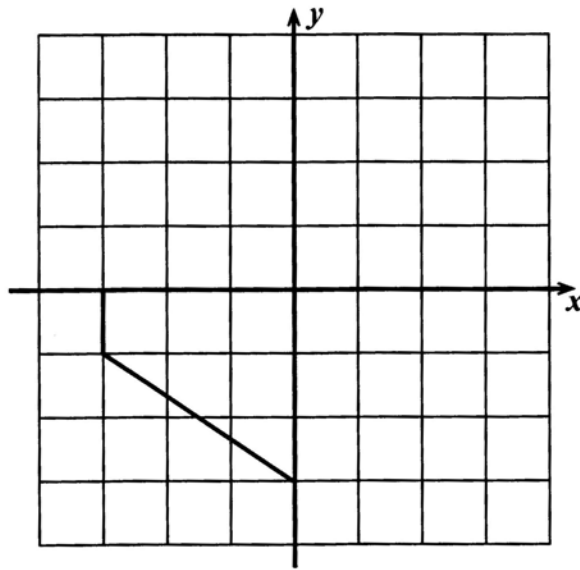
(b) 17.5% to a decimal number,

Answer: _____ [1]

(c) $\frac{13}{20}$ to a percentage.

Answer: _____ % [1]

4. Complete the diagram so that it is symmetrical about both the x and y axes.



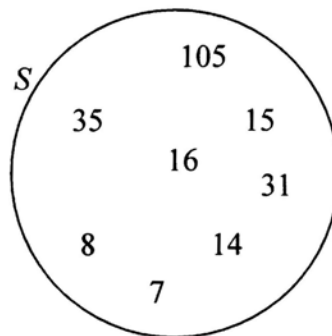
[3]

5. Simplify

$$7 + 3(9 - 4) \times 6$$

Answer: _____ [3]

- 6.



From the set S above, write down

- (a) the factors of 48,

Answer: _____ [2]

- (b) the multiples of 3.

Answer: _____ [2]

7.



8:45 a.m.



9:30 a.m.

The Labour Day "Men's Marathon" began at 8:45 a.m. Jack finished the marathon at 11:10 a.m.

- (a) Calculate, in hours and minutes, the time taken to run the course.

Answer: _____ hrs _____ mins. [2]

The Labour Day "Women's Marathon" began at 9:30 a.m. Sue took $2\frac{2}{3}$ hours to finish the marathon.

- (b) Calculate the time she finished the course.

Answer: _____ [2]

8.



Adam, Bill and Cory spent the day fishing. Adam caught f fish. Bill caught three times as many fish as Adam. Cory caught 7 less fish than Adam.

Write an expression, in terms of f , for

- (a) the number of fish caught by Bill,

Answer: _____ fish [1]

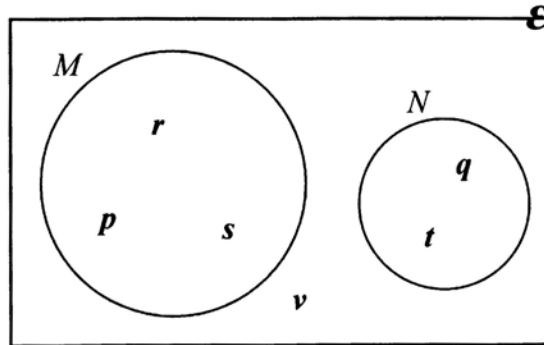
- (b) the number of fish that Cory caught,

Answer: _____ fish [1]

- (c) the total number of fish caught, giving your answer in simplest form.

Answer: _____ fish [2]

9. The Venn diagram shows the sets M and N contained in the universal set $\mathcal{E}$.



- (a) List the elements in the set

(i) $M \cup N$,

Answer: _____ [1]

(ii) $M \cap N$,

Answer: _____ [1]

(iii) N' .

Answer: _____ [1]

- (b) Write down the value of

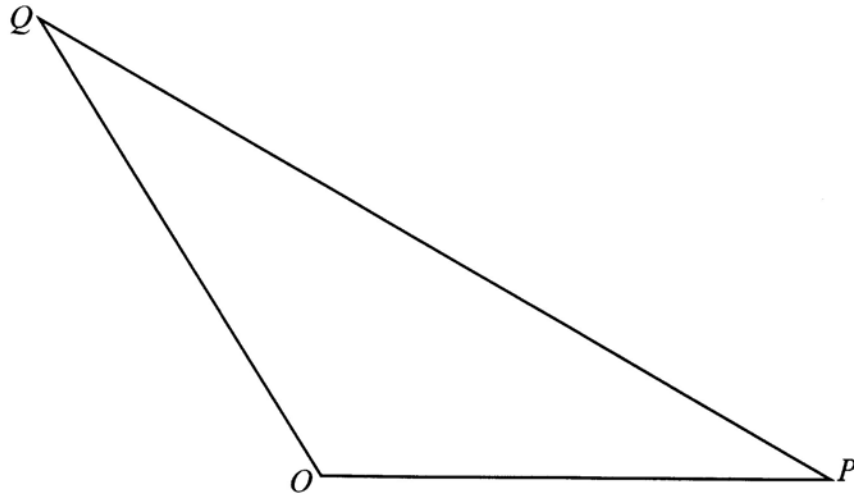
(i) $n(M)$,

Answer: _____ [1]

(ii) $n(M' \cap N')$.

Answer: _____ [1]

10.



- (a) Using a protractor, measure and write down the size of $\angle O$.

Answer: _____ $^{\circ}$ [1]

- (b) Using the centimetre scale, measure and write down the length of PQ .

Answer: _____ cm [1]

- (c) Leaving **ALL** construction lines, use a pencil, ruler and a pair of compasses only to bisect $\angle OPQ$. [3]
-

11. Eric works at the *ACME Company*. His incomplete statement of earnings for last week is shown below. Calculate and complete his earnings statement.

ACME COMPANY Weekly Earnings Statement	
<u>Earnings</u>	
Regular Hours 40 hours at \$12.60 per hour	
Overtime Hours 8 hours at \$18.90 per hour	
Gross Wages	
<u>Deductions</u>	
National Insurance	\$19.56
Union Dues	\$5.00
Medical Insurance	\$34.84
Total Deductions	
Net Wages	

[5]

12.



A nail manufacturing machine punches out $1\frac{3}{4}$ inch nails from a coil of wire.

Calculate

- (a) the length of coil needed to produce 240 nails. (Assume there is no waste in the production.)

Answer: _____ ins. [2]

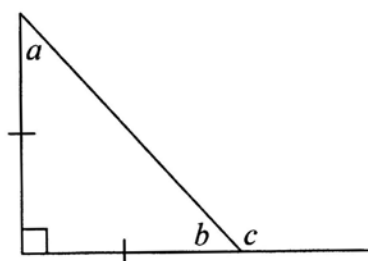
- (b) the amount of nails that can be produced from a coil of length 875 inches.

Answer: _____ [2]

- (c) the difference in length between a $2\frac{1}{2}$ inch nail and a $1\frac{3}{4}$ inch nail.

Answer: _____ [1]

13. Calculate the size of



NOT TO
SCALE

(a) (i) angle a ,

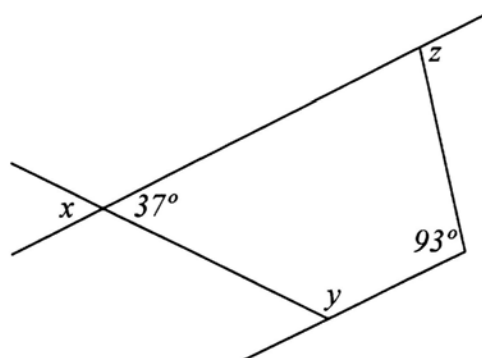
Answer: _____ ° [1]

(ii) angle b ,

Answer: _____ ° [1]

(iii) angle c ,

Answer: _____ ° [1]



NOT TO
SCALE

(b) (i) angle x ,

Answer: _____ ° [1]

(ii) angle y ,

Answer: _____ ° [1]

(iii) angle z .

Answer: _____ ° [1]

14. (a) Given that $z = 9$ and $w = 13$, calculate the value of $z^2 + \frac{w}{4}$.

Answer: _____ [3]

- (b) Solve $7(p - 5) = 21$

Answer: _____ [3]

15.



Two business partners, Mr. Evans and Mrs. Frazer, share profits in the ratio 5 : 6.
The profits for this year were \$26,400.

- (a) Calculate Mr. Evans' share.

Answer: \$ _____ [2]

Last year, Mrs. Frazer received \$8,400 as her share.

- (b) Calculate the total profit for last year.

Answer: \$ _____ [2]

With renovations to the business, Mr. Evans' and Mrs. Frazer's investments changed to \$17,500 and \$22,500 respectively.

- (c) Calculate the ratio of investments in simplest form.

Answer: _____ [2]

16. Sugar is sold in three types: powdered, granulated, cubed. It is also sold in three packages: small, medium, large. The table shows the type and number of packages of sugar sold. Complete the table.

SUGAR	Small	Medium	Large	Total
Powdered	80	35	26	
Granulated		50		120
Cubed	40	45		
Total	135		135	400

[6]

- 17.



James purchased a sailboat for \$23,000. He paid a deposit of \$5,000 and obtained a loan from the bank for the balance.

- (a) Calculate the amount borrowed from the bank.

Answer: \$ _____ [1]

He agreed to repay the loan in 3 years at the rate of $9\frac{1}{2}\%$ simple interest.

- (b) Calculate the total amount repaid to the bank.

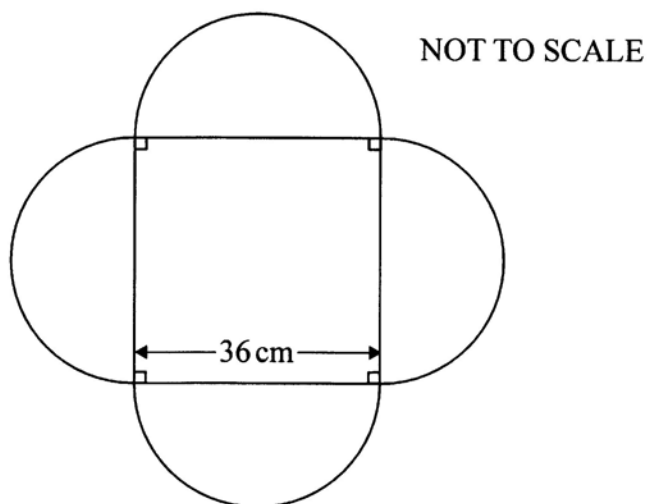
Answer: \$ _____ [3]

James repaid the loan in equal monthly payments.

- (c) Calculate his monthly payments.

Answer: \$ _____ [2]

18. A window is in the shape of a square and four semicircles as shown. The square is of side 36 cm.



Using $\pi = 3.14$ where necessary, calculate

- (a) the area of the square section,

Answer: _____ cm^2 [2]

- (b) the area of a semicircular section,

Answer: _____ cm^2 [3]

- (c) the total area of the window.

Answer: _____ cm^2 [2]

19. Simplify

(a) $-7(x-5)$

Answer: _____ [2]

(b) $9y+5z-8z+y$

Answer: _____ [2]

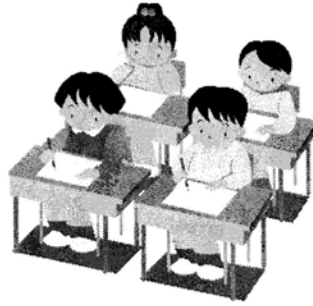
(c) $\frac{9}{10}a^3 \times \frac{2}{3}a$

Answer: _____ [2]

(d) $18b^6 \div 3b^2$

Answer: _____ [2]

20.



Sixteen students were asked how many hours each studied for the final mathematics exam. Their responses are recorded below.

8, 4, 3, 0, 0, 5, 0, 2, 1, 3, 7, 0, 4, 5, 6, 4

- (a) Write down the mode.

Answer: _____ [1]

- (b) Calculate

- (i) the median,

Answer: _____ [3]

- (ii) the mean.

Answer: _____ [2]

A student is selected at random from this group.

- (c) Calculate the probability that this student

- (i) did not study,

Answer: _____ [1]

- (ii) studied 5 hours,

Answer: _____ [1]

- (iii) studied less than 5 hours.

Answer: _____ [1]

MATHEMATICS

PAPER 2 (CORE/EXTENDED) 3815/2

Tuesday **20 MAY 2014** 9:00 A.M.–11:00 A.M.

Additional materials:

Calculator (not graphing)

Geometrical instruments

Answer booklet

Graph paper

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS

BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION

INSTRUCTIONS TO CANDIDATES

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ALL working must be done in blue or black ink, except for drawings, lines and constructions which may be done in pencil.

INFORMATION FOR CANDIDATES

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Tracing paper may be used.

The mark for each question, or part question, is shown in brackets [].

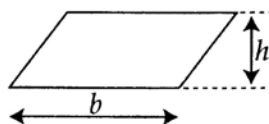
The total number of marks for this paper is 100.

This question paper consists of 10 printed pages and 2 blank pages.

INFORMATION AND FORMULAE

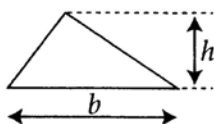
MENSURATION

Parallelogram



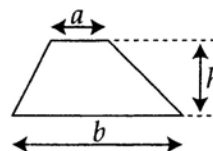
$$\text{Area} = bh$$

Triangle



$$\text{Area} = \frac{1}{2}bh$$

Trapezium



$$\text{Area} = \frac{1}{2}(a+b)h$$

Circle (radius r , diameter d)

$$\text{Circumference} = 2\pi r \text{ or } \pi d$$

$$\text{Area} = \pi r^2$$

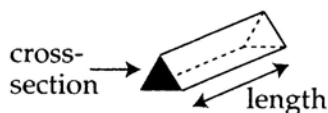
Cylinder (radius r , height h)

$$\text{Volume} = \pi r^2 h$$

Prism

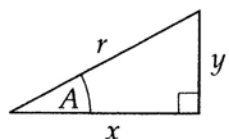
$$\text{Volume} = \text{area of cross-section} \times \text{length}$$

e.g. triangular prism

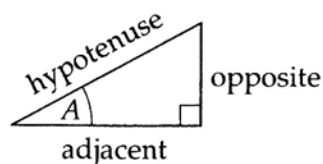


TRIGONOMETRY

Right-angled triangle



$$r^2 = x^2 + y^2, \text{ (result of Pythagoras)}$$



$$\sin A = \frac{\text{opposite}}{\text{hypotenuse}}, \cos A = \frac{\text{adjacent}}{\text{hypotenuse}}, \tan A = \frac{\text{opposite}}{\text{adjacent}}$$

NUMBER

Standard form is $a \times 10^n$ where $1 \leq a < 10$ and n is an integer.

1. Evaluate:

- (a) 6^3 [1]
- (b) 7^0 [1]
- (c) $(0.3)^2$ [1]
-

2. Write 739.96 correct to

- (a) the nearest whole number, [1]
- (b) one significant figure, [1]
- (c) one decimal place. [1]
-

3. Let n represent the number. Write each phrase as an algebraic expression.

- (a) The number decreased by 7. [1]
- (b) The quantity 9 plus the number, divided by 4. [2]
-

4.



- (a) The hourly cost to employ 7 masons is \$94.15. Calculate the hourly cost to employ 4 masons. [2]
- (b) Eight masons can build a wall in 5 hours. Calculate how long it will take for 6 masons to build this wall if all of the masons work at the same rate. [2]
-

5. Solve

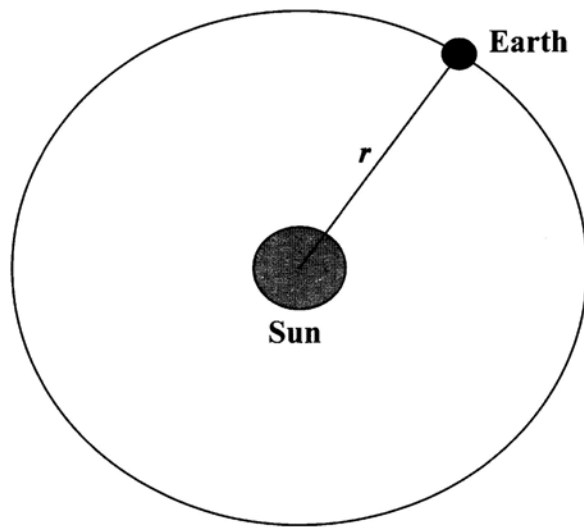
$$\frac{3x}{5} - \frac{1}{4} = \frac{3x}{10}$$

[4]

11-6x ≤ 23

6. (a) Solve the inequality $11 - 6x \geq 23$ [3]
 (b) Graph your solution for (a) on a directed number line. [2]
-

7. The earth's orbit about the sun in a year is approximately a circle with a radius (r) of 1.5×10^8 km.



Using $\pi = 3.14$, calculate, giving your answers in scientific notation/standard form,

- (a) the distance the earth travels in one year, [2]
 (b) the distance the earth travels in one day. (1 year = 365 days). [3]
-

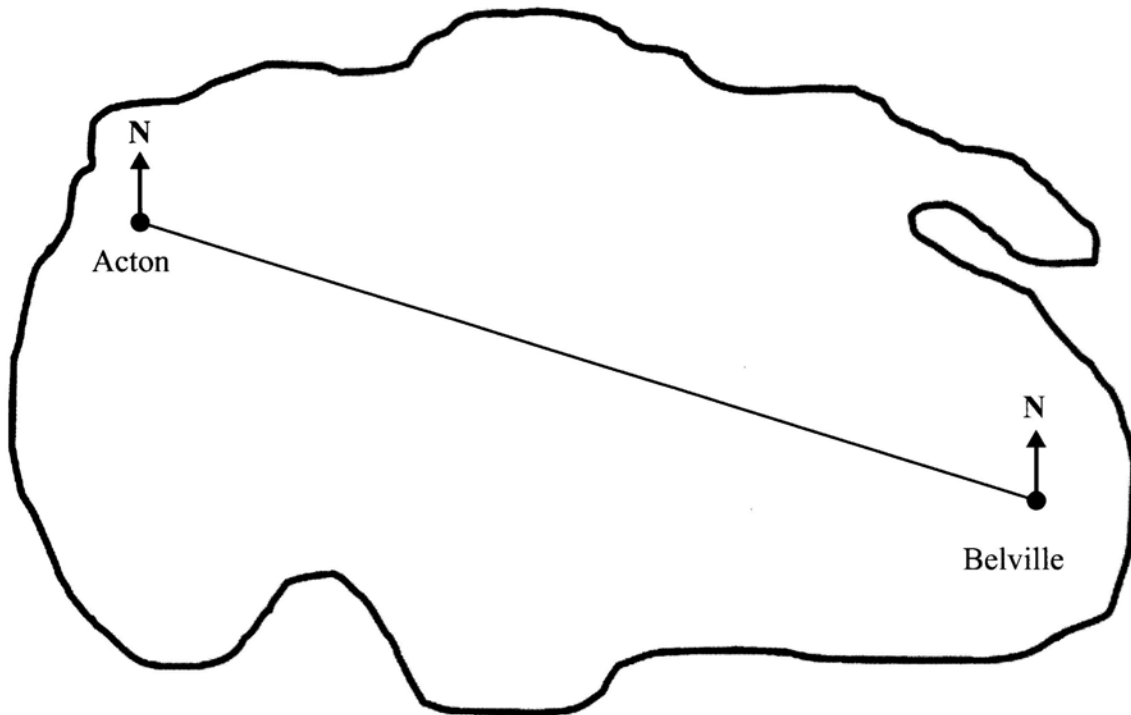
8. Solve the following pair of simultaneous equations

$$\begin{aligned} x - 6y &= 19 \\ 2x + 7y &= 0 \end{aligned}$$

[5]

9. The diagram is a **scale drawing** of an island with the villages Acton and Belville indicated.

Scale: 1 cm represents 15 km

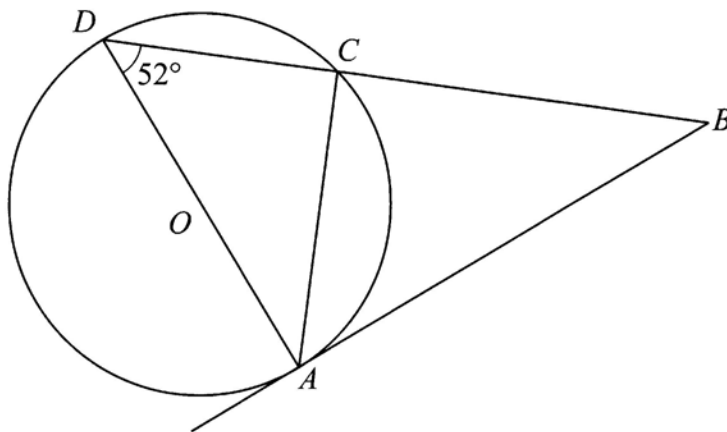


- (a) Calculate the shortest distance (in km) between Acton and Belville. [2]
- (b) Write down the bearing of Belville from Acton. [1]
- (c) Write down the bearing of Acton from Belville. [1]

A land surveying crew drove east a distance of 96 km from Acton.

- (d) Calculate the length east from Acton that this would be on the scale drawing. [2]

10. (a) In the diagram, O is the centre of the circle. AB is tangent to the circle at A and $\angle ADB = 52^\circ$.

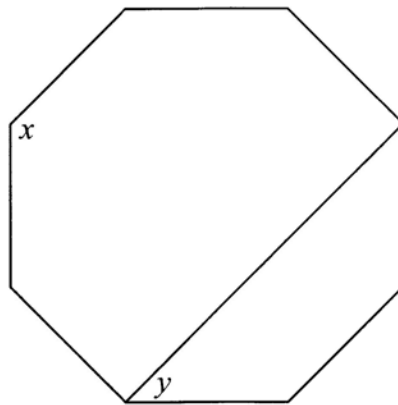


NOT TO SCALE

Calculate the value of

- | | | |
|-------|----------------|-----|
| (i) | $\angle CAD$, | [1] |
| (ii) | $\angle CAB$, | [1] |
| (iii) | $\angle CBA$. | [1] |

- (b) The polygon below is a regular octagon.

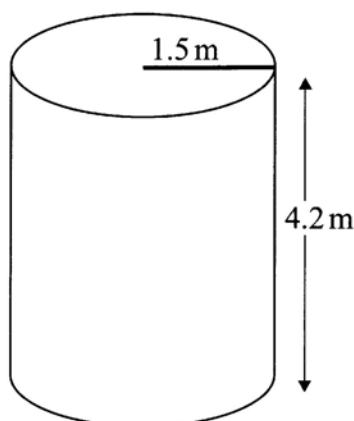


NOT TO SCALE

Calculate the size of the angle

- | | | |
|------|-------|-----|
| (i) | x , | [2] |
| (ii) | y . | [2] |

11. The diagram shows a cylindrical storage container of radius 1.5 m and height 4.2 m.



NOT TO SCALE

- (a) Using $\pi = \frac{22}{7}$, calculate the volume of the container when full. [3]

The contents of the container are packaged in boxes with a square base of side 15 cm and height 20 cm.

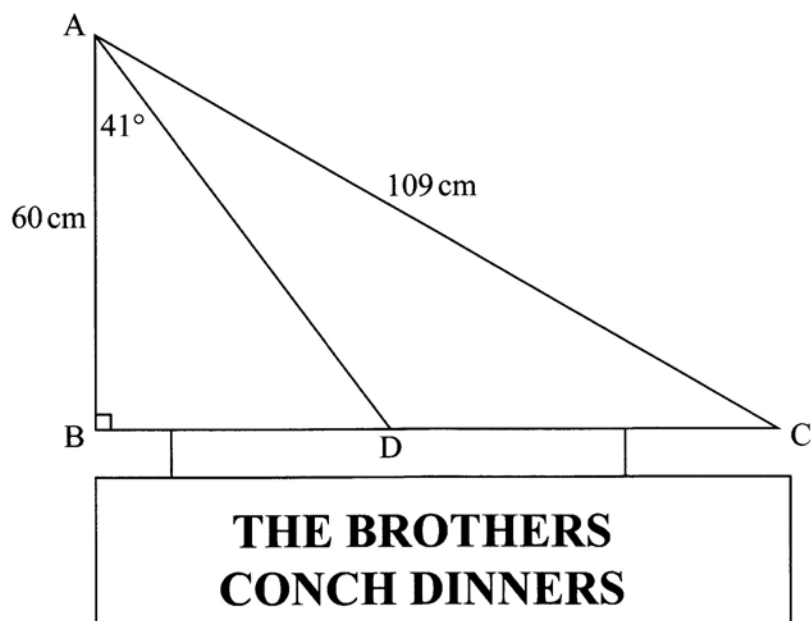
- (b) Calculate the volume of a box, giving your answer in cubic metres. [3]
- (c) Calculate the number of boxes that can be packaged from a full container. [1]

-
12. The formula for the cost of electricity per month b , in dollars, for the use of E kilowatt-hours of electricity is

$$b = 40 + \frac{7E}{50}$$

- (a) Calculate the monthly bill when 705 kilowatt-hours are used. [2]
- (b) Calculate the number of kilowatt-hours used when the monthly bill is \$61.14. [3]
- (c) Make E the subject of the formula. [3]
-

13. The diagram shows the support bracket for a restaurant sign. $AB = 60\text{ cm}$, $AC = 109\text{ cm}$ and $\angle BAD = 41^\circ$.



NOT TO SCALE

Calculate

- | | | |
|-----|--------------------------|-----|
| 13. | (a) the length of BC , | [3] |
| | (b) the angle C , | [3] |
| | (c) the length of AD . | [3] |
-
14. (a) Factorise completely
- $12x^2y + 8xy^2 - 4y$ [3]
- (b) Simplify
- (i) $3 + 7(5 - 2b) + 4b$ [3]
- (ii) $\frac{3a}{5} + \frac{a}{6}$ [3]
-

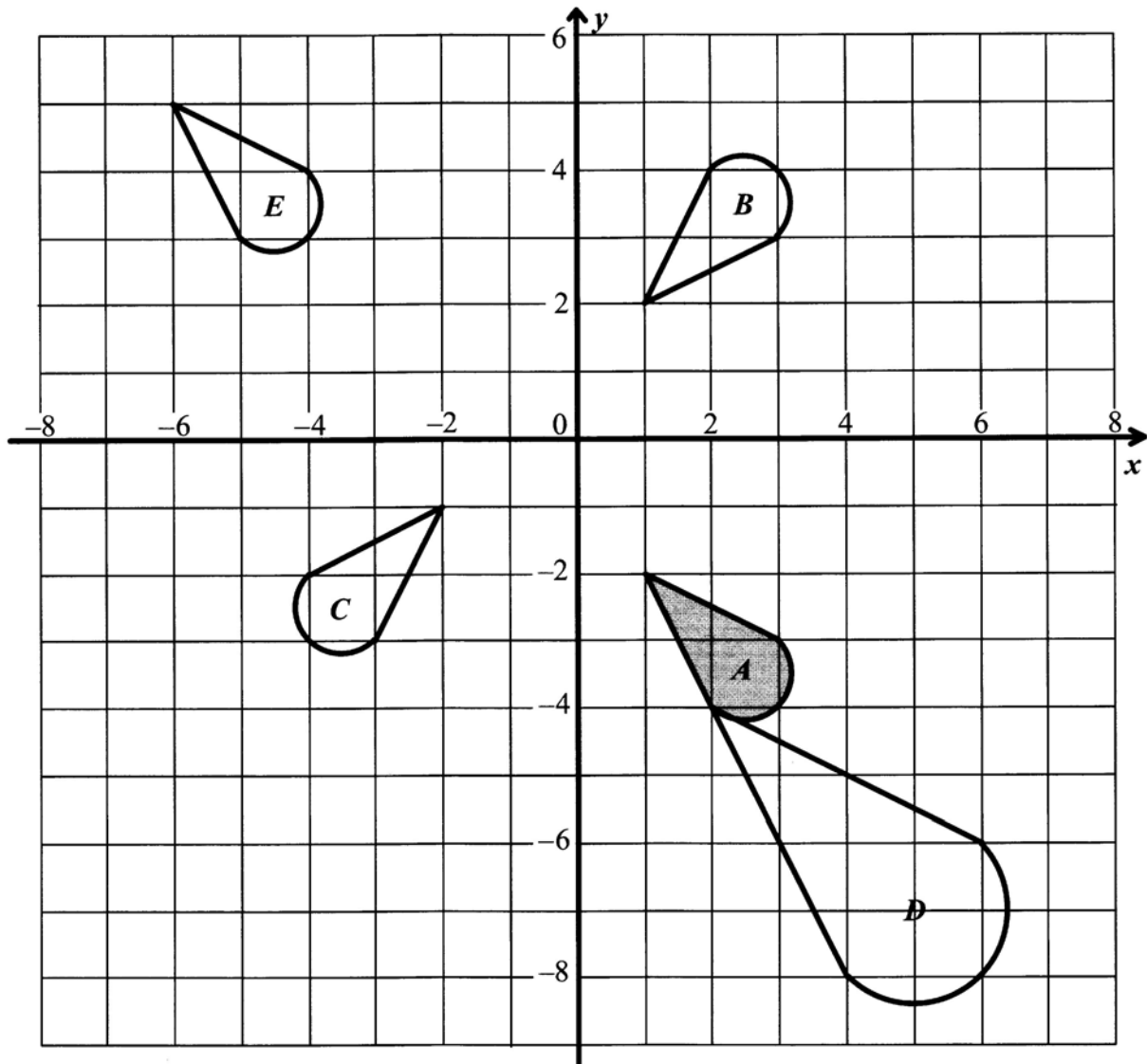
ANSWER THIS ENTIRE QUESTION ON THE GRAPH PAPER PROVIDED

15. (a) Copy and complete the following table for the graph of $y = -2x - 4$. [2]

x	-4	-2	0	2
y	4		-4	

- (b) Using a scale of 1 cm to 1 unit for values of x from -6 to 4 and values of y from -8 to 8, draw the graph of the line $y = -2x - 4$. [3]
- (c) Calculate the gradient of your graph in (b). [2]
- (d) Another graph goes through the point (3, 5) and has a gradient of $\frac{1}{2}$. Draw this graph on the same coordinate plane. [3]
- (e) Write down the coordinates of the point where the lines intersect. [1]
-

16.



Describe completely the single transformation that maps

- (a) figure *A* onto figure *B*, [2]
- (b) figure *A* onto figure *C*, [3]
- (c) figure *A* onto figure *D*, [3]
- (d) figure *A* onto figure *E*. [3]

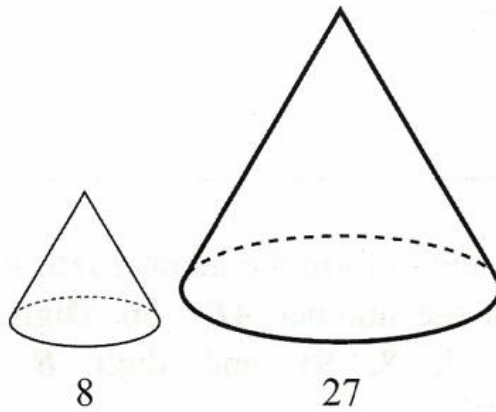
BGCSE Mathematics
Year 2014
Paper 3

1. Reduce this fraction to simplest form.

$$\frac{x^6 y^{-2} z^3}{4x^2 yz^3}$$

[3]

2.



Two similar cones have volumes in the ratio of 8 : 27.

Calculate the ratio of their

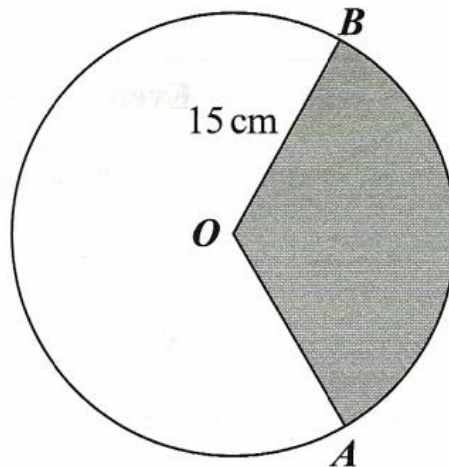
(a) heights,

[2]

(b) surface areas.

[1]

3. In the circle with centre O , the radius is 15 cm and the obtuse angle $\angle AOB = 120^\circ$.



Calculate, using $\pi = 3.14$,

(a) the length of the minor arc AB ,

[2]

(b) the area of the shaded sector AOB .

[2]

4. (a) For the matrix $A = \begin{pmatrix} 13 & 8 \\ 9 & 5 \end{pmatrix}$, calculate the determinant, $|A|$. [1]
- (b) Solve for x and y in the matrix equation $\begin{pmatrix} 2 & 1 \\ 3 & -4 \end{pmatrix} \begin{pmatrix} x \\ 3 \end{pmatrix} = \begin{pmatrix} 17 \\ y \end{pmatrix}$. [4]

5. Expand and simplify

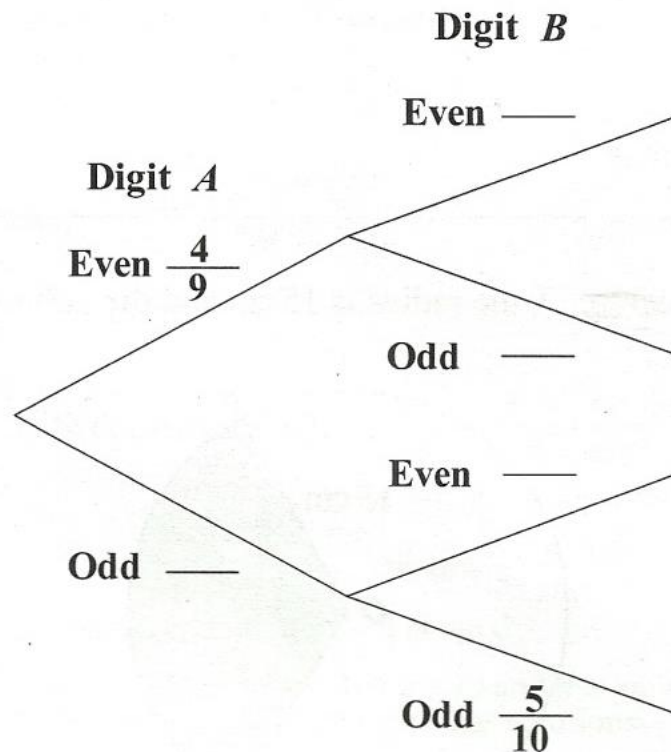
(a) $(3a + 2b)(2a - b)$ [3]

(b) $(p - 2q)^2$ [3]

6. Digits A and B are selected to form the number AB . For example, if $A = 3$ and $B = 6$ are selected, they form the number $AB = 36$. Digit A is randomly selected from $\{1, 2, 3, 4, 5, 6, 7, 8, 9\}$ and digit B is randomly selected from $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$.

Consider 0 to be an even digit.

- (a) Draw and complete the tree diagram. [2]



- (b) Calculate the probability that
- (i) both digits in the number AB are even, [2]
- (ii) one digit is odd and the other is even, in any order, [2]
- (iii) the digits produce the number $AB = 36$. [1]

7. The functions f and g are defined as follows:

$$f: x \rightarrow 7 - 2x$$

$$g: x \rightarrow x^3$$

- (a) Calculate the value of

(i) $f\left(-\frac{1}{2}\right),$ [1]

(ii) $g(4).$ [1]

- (b) Calculate the values of x for which

(i) $f(x) = -11,$ [2]

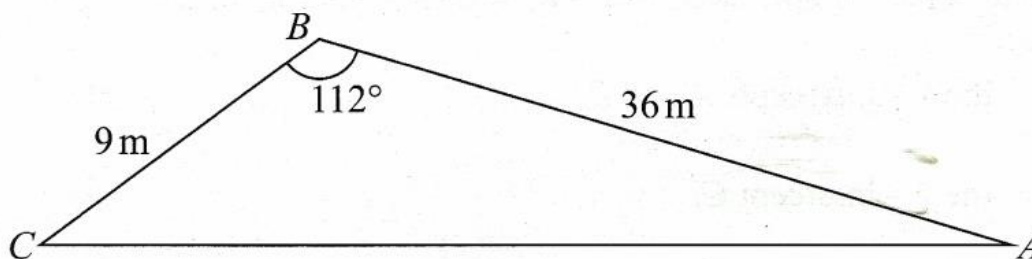
(ii) $g(x) = 216.$ [2]

- (c) Give an algebraic expression for

(i) $fg: x \rightarrow,$ [1]

(ii) $g^{-1}: x \rightarrow.$ [1]

8.



The diagram shows the cross-section of a roof of an airplane hangar.

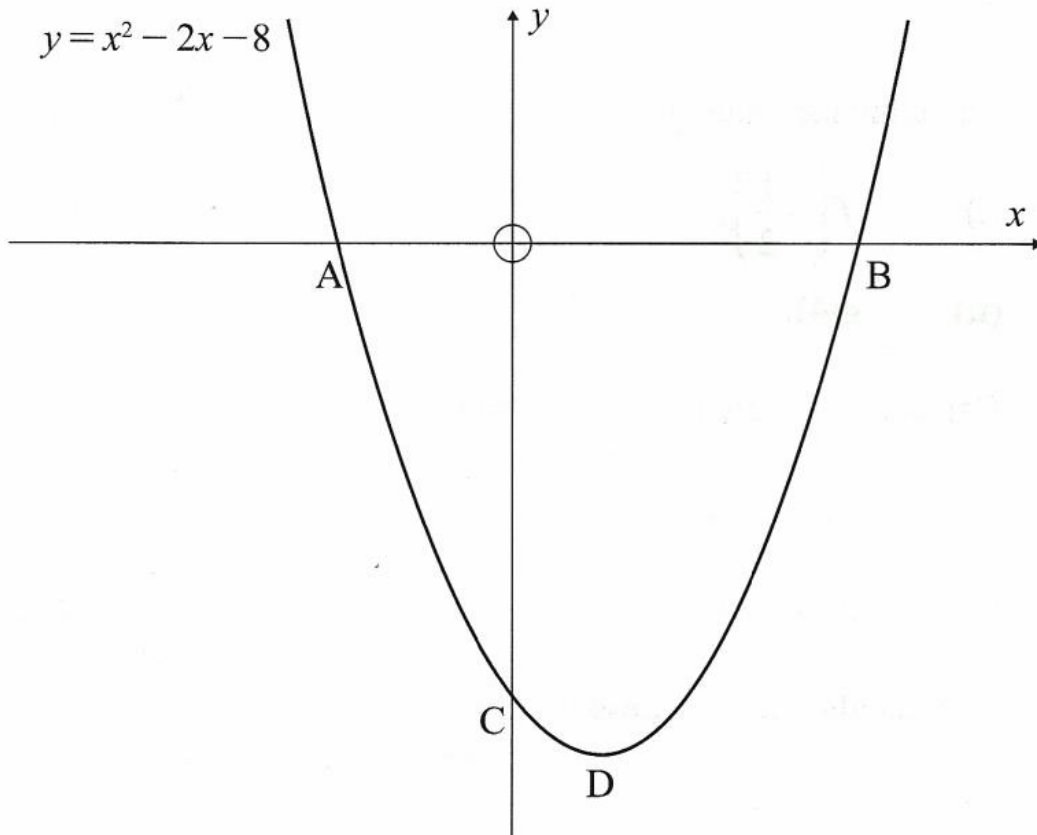
$AB = 36\text{ m}$, $BC = 9\text{ m}$ and $\angle ABC = 112^\circ$.

Calculate

- (a) the span, AC , of the roof to the nearest metre, [4]

- (b) the angle of inclination, $\angle BAC$, to the nearest degree. [4]

9. The diagram shows part of the graph of $y = x^2 - 2x - 8$ cutting the x - axis at A and B , and the y - axis at C . The vertex of the parabola is at D .



Calculate, showing sufficient working to justify your answers,

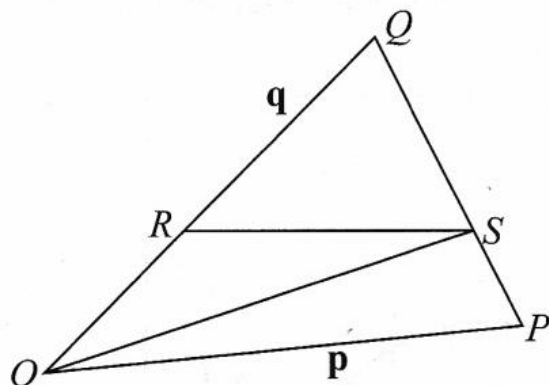
- (a) the x - intercepts A and B , [3]
- (b) the y - intercept C , [1]
- (c) the coordinates of the vertex D . [4]
10. (a) Write as a single fraction in simplest form .
- (i) $\frac{a+1}{3} - \frac{a-2}{4}$ [3]
- (ii) $\frac{1}{n-2} + \frac{2}{n-3}$ [3]
- (iii) $\frac{5b^2}{3} \div \frac{10b}{21}$ [3]
- (b) Factorise and simplify
- $\frac{3x+12}{x^2-16}$ [3]

11. (a) For the column vectors $\mathbf{x} = \begin{pmatrix} 15 \\ -8 \end{pmatrix}$ and $\mathbf{y} = \begin{pmatrix} -3 \\ 4 \end{pmatrix}$,
calculate

(i) the column vector $\mathbf{z} = 2\mathbf{x} - 3\mathbf{y}$, [2]

(ii) $|\mathbf{x}|$, the magnitude of $\mathbf{x}$. [2]

(b)



NOT TO SCALE

In the triangle OPQ , $\overrightarrow{OP} = \mathbf{p}$, $\overrightarrow{OQ} = \mathbf{q}$, $QS = \frac{2}{3}QP$ and $OR = k \cdot OQ$.

Find, in terms of $\mathbf{p}$, $\mathbf{q}$ and/or k , simplifying where possible

(i) $\overrightarrow{QP}$, [1]

(ii) $\overrightarrow{QS}$, [1]

(iii) $\overrightarrow{OS}$, [2]

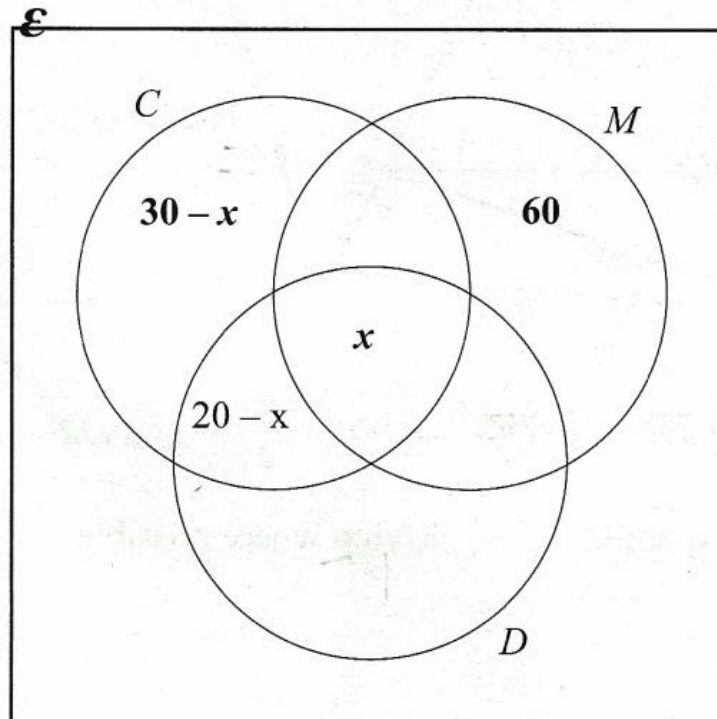
(iv) $\overrightarrow{RS}$. [2]

RS is parallel to OP .

(v) Calculate the value of k . [2]

12. In a survey taken at the *Nassau Film Festival*, 200 attendees were asked for which categories of film they had purchased tickets. The categories surveyed were commentaries (C), documentaries (D) and movies (M). 35 had tickets for commentaries and movies only. 20 had tickets for commentaries and documentaries. 40 had tickets for documentaries and movies. 74 had tickets for documentaries. 18 did not have tickets for any of the three categories surveyed.

- (a) Given that x represents the number of people who had tickets for all three categories, sketch and complete the Venn diagram given below. [4]



- (b) Form an equation in terms of x and solve it. [4]
- (c) Using your value for x , calculate the value of
- (i) $n(C \cap M)$, [1]
 - (ii) $n(D')$. [1]
- (d) How many people had tickets for
- (i) documentaries and movies only, [1]
 - (ii) only two of these film categories. [1]

13. The results of 200 candidates in a National Mathematics Exam are as follows:

% Mark	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
No. of Candidates	4	10	20	38	80	28	8	8	2	2

- (a) Copy and complete the following cumulative frequency table.

% Mark	Cumulative Frequency
10 or less	4
20 or less	14
30 or less	34
40 or less	72
50 or less	
60 or less	
70 or less	
80 or less	
90 or less	
100 or less	

[2]

- (b) Using a horizontal scale of 1 cm to represent 10%, and a vertical scale of 2 cm to represent 20 candidates, draw and label a cumulative frequency curve for these results. [4]

- (c) From your graph, estimate

- (i) the median mark, [1]
- (ii) the number of students who scored 60% or more, [2]
- (iii) the pass mark if 70% of the candidates were successful. [3]