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MATHEMATICS

PAPER 1 (CORE LEVEL)

Tuesday **18 MAY 1999** 1.00 – 2.30 P.M.

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.

INFORMATION FOR CANDIDATES

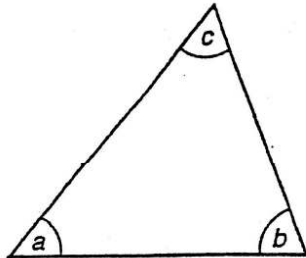
Calculators may be used.

Geometrical instruments are required.

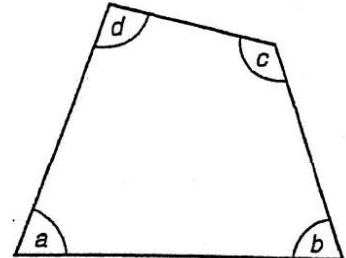
The mark for each question, or part question is shown in brackets [].

The total number of marks for this paper is 100.

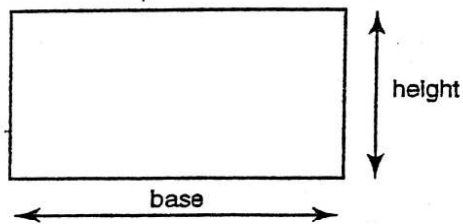
INFORMATION AND FORMULAE



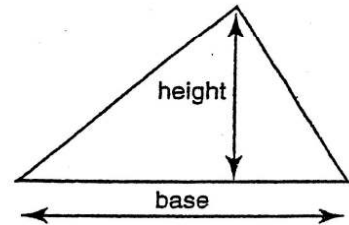
Angle sum of triangle
 $a + b + c = 180^\circ$



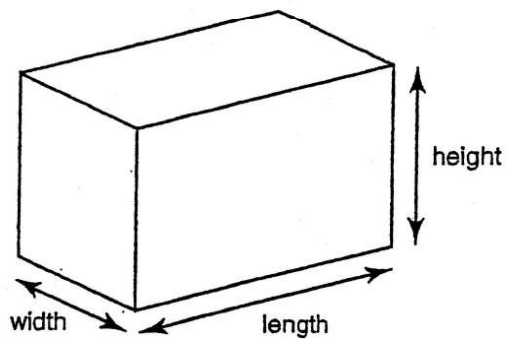
Angle sum of quadrilateral
 $a + b + c + d = 360^\circ$



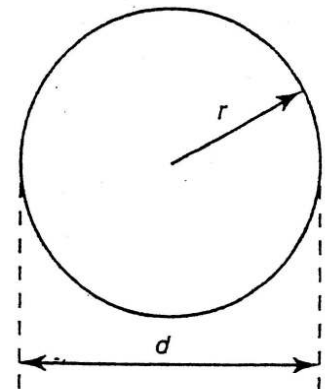
Area of rectangle = base $\times$ height



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

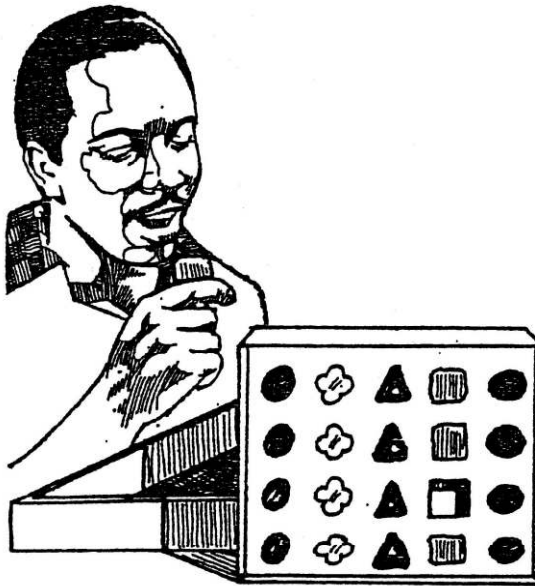


Volume of cuboid = length $\times$ width $\times$ height



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

1.



Chocolates

Aaron buys a box of 20 mixed chocolates. He does not like five of them. He selects one chocolate at random.

Find the probability that he will select a chocolate that he does not like.

Answer: _____ [2]

2. Write down the next two numbers in the series

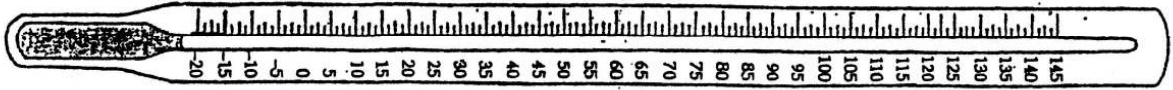
1, 3, 5, 7, _____, _____.

Answer: _____, _____ [2]

3. Write 65% as a fraction in its lowest terms.

Answer: _____ [2]

4.



Last night the temperature at the airport was -10°F . By midday it had risen by 12°F .

What was the midday temperature?

Answer: _____ $^{\circ}\text{F}$ [2]

5. Evaluate, giving your answer correct to 3 significant figures.

$$\frac{0.0785}{0.249}$$

Answer: _____ [2]

6. (a) Express 64 as a product of its prime factors.

Answer: _____ [2]

(b) Write your answer in index form.

Answer: _____ [1]

7 Write 17.36 m correct to

(i) the nearest whole number,

Answer: _____ m [1]

(ii) one decimal place,

Answer: _____ m [1]

(iii) the nearest ten.

Answer: _____ m [1]

8. From the given list, write the special name for each shape.

cuboid
cylinder
cone
prism

(a)



Answer: _____ [1]

(b)



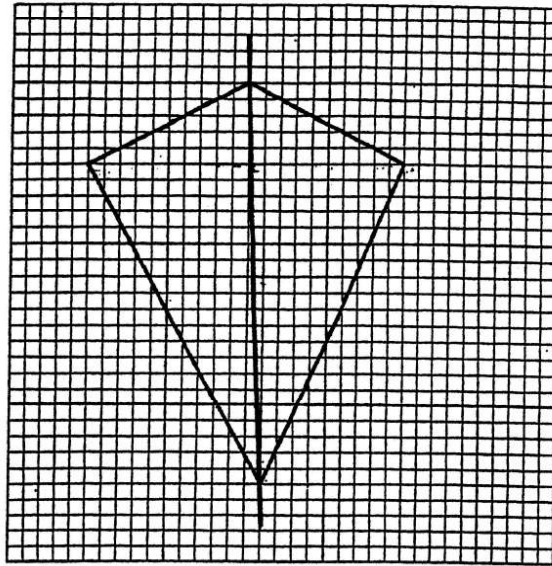
Answer: _____ [1]

(c)



Answer: _____ [1]

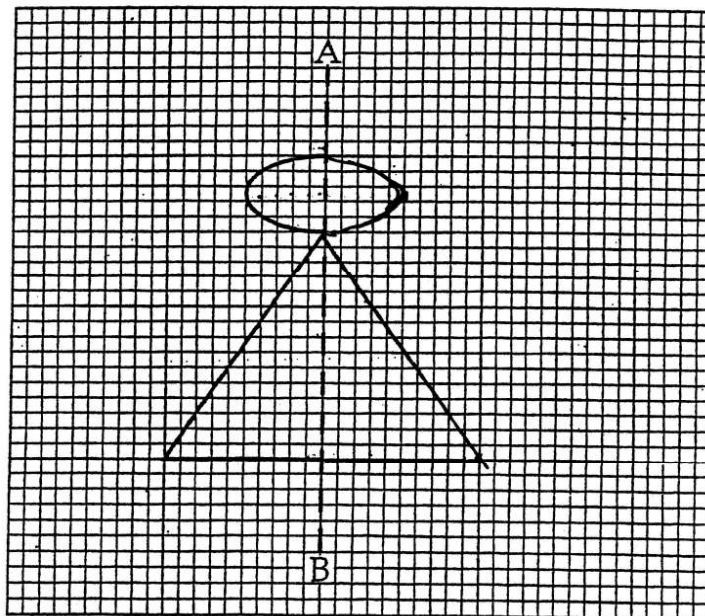
9. (a)



Draw in the line of symmetry on this shape.

[1]

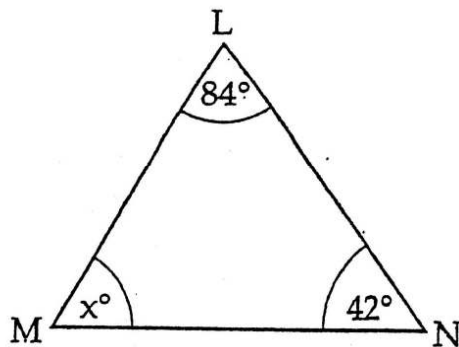
(b)



Given that AB is the line of symmetry, complete the shape.

[2]

10.



- (a) Calculate the missing angle in this triangle.

Answer: _____ $^\circ$ [2]

- (b) -- What type of triangle is $\triangle LMN$?

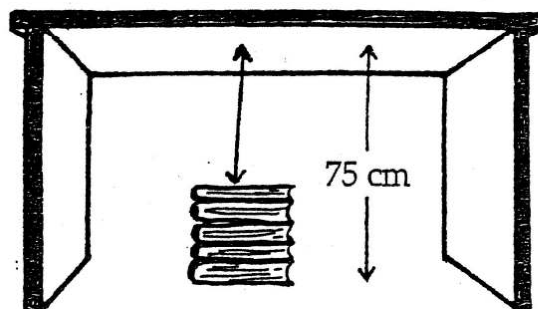
Answer: _____ [1]

11. Solve for p.

$$3p = p + 6$$

Answer: _____ [3]

12.



A pile of 6 books, each 6.7 cm thick, is stacked underneath a table 75 cm high.

Calculate

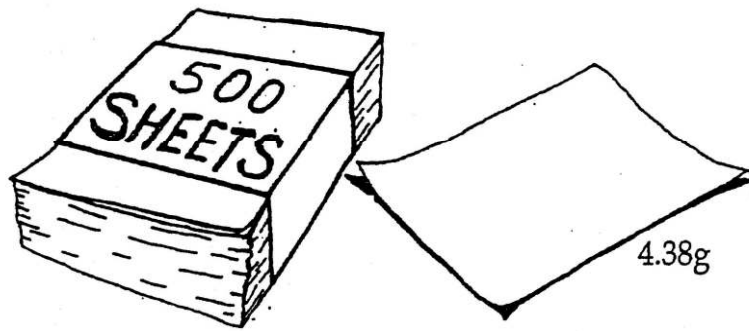
- (a) the total height of the 6 books,

Answer: _____ cm [2]

- (b) the difference between the height of the table and the total height of the books.

Answer: _____ cm [2]

13.



One sheet of paper has a mass of 4.38 g.

- (a) Calculate the total mass of 500 sheets.

Answer: _____ g [2]

- (b) Convert your answer in (a) to kilograms.

Answer: _____ kg [2]

14.



A filing clerk earns an annual salary of \$10,200.

(a) Calculate her monthly salary.

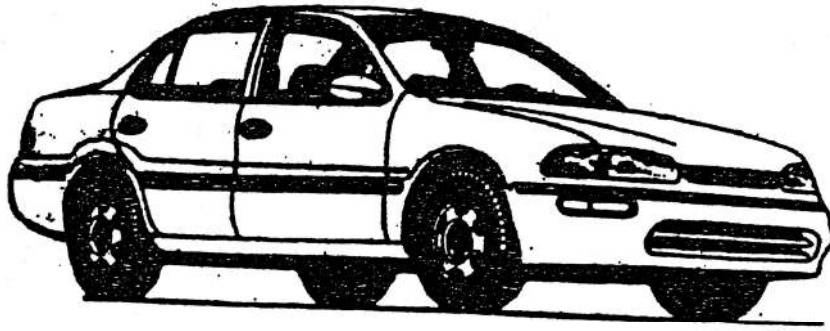
Answer: \$ _____ [2]

Monthly deductions are: National Insurance \$26.50
Bank Loan \$75.

(b) Calculate her monthly take home pay.

Answer: \$ _____ [3]

15.



A car travels 96 km in one hour.

(a) Convert

(i) 96 km to metres,

Answer: _____ m [2]

(ii) 1 hour to minutes.

Answer: _____ min [1]

(b) Calculate the number of metres the car travels in one minute.

Answer: _____ [2]

16. From the set of numbers {2, 3, 4, 5, 6} write down

(a) the factors of 10,

Answer: _____ [2]

(b) all multiples of 3,

Answer: _____ [2]

(c) a factor of 8 which is not a prime number.

Answer: _____ [1]

17. During one week Tim spends $\frac{1}{6}$ of his time with entertainment, $\frac{1}{3}$ doing lessons and $\frac{1}{9}$ in sports.

Entertainment $\frac{1}{6}$	LESSONS $\frac{1}{3}$	Sports $\frac{1}{9}$	Other Things
--------------------------------	--------------------------	-------------------------	--------------

Calculate

(a) the total fraction of his time occupied,

Answer: _____ [3]

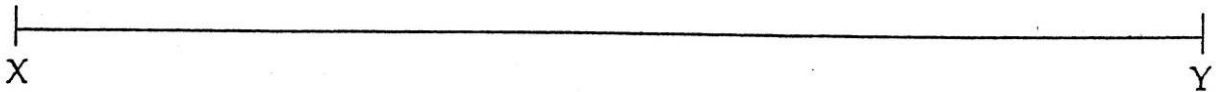
(b) the fraction of his time left to do other things.

Answer: _____ [2]

18. (a) Using ruler and compass only, construct ΔABC with $AB = 6\text{cm}$, $BC = 5\text{cm}$ and $AC = 4\text{cm}$.

[3]

- (b) Measure line XY in inches.



Answer: _____ inches [1]

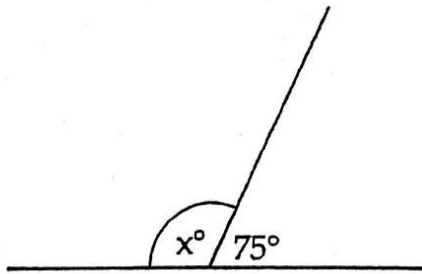
- (c) Angle $XYZ = 70^\circ$

Use a protractor to draw this angle at Y.

[2]

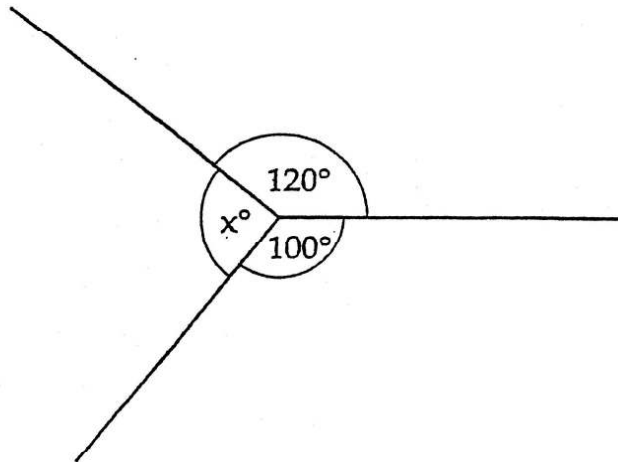
19. Calculate the value of x in each shape.

(a)



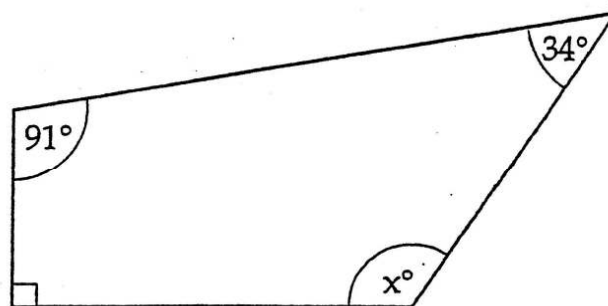
Answer: $x = \underline{\hspace{2cm}}^\circ$ [2]

(b)



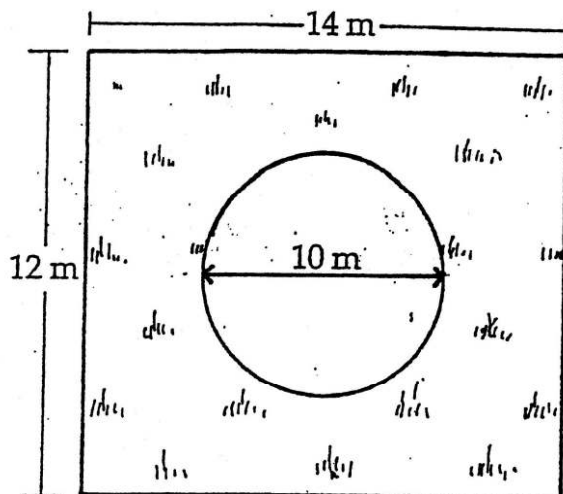
Answer: $x = \underline{\hspace{2cm}}^\circ$ [2]

(c)



Answer: $x = \underline{\hspace{2cm}}^\circ$ [2]

20.



A circular pond of diameter 10 m is situated on a plot of land 12 m by 14 m. Using $\pi = 3.14$,

Calculate

- (a) the area of
- (i) the plot of land,

Answer: _____ m^2 [2]

- (ii) the pond.

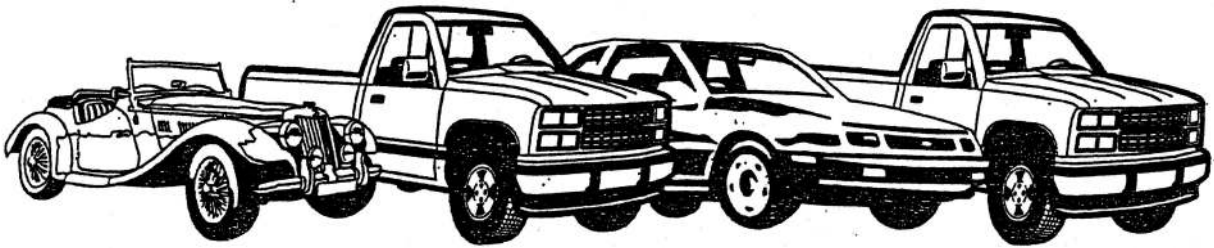
Answer: _____ m^2 [2]

- (b) The pond is surrounded by grass.

Find the area of the grass.

Answer: _____ m^2 [2]

21.



- (a) There are 20 cars and 15 trucks in a parking lot.

Write down the ratio of cars to trucks in its simplest form.

Answer: _____ [2]

- (b) The cost of 8 similar books is \$20.32.

Calculate the cost of

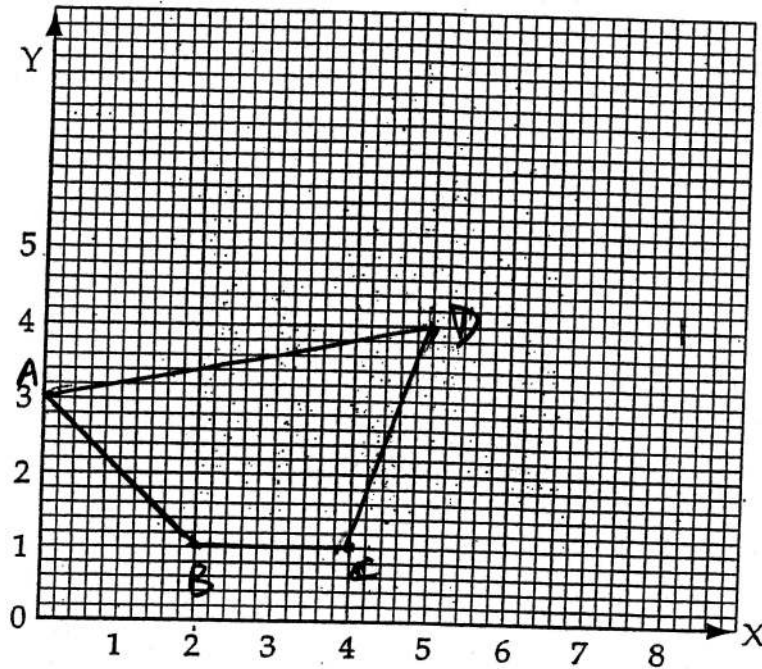
- (i) 1 book,

Answer: \$ _____ [2]

- (ii) 13 books.

Answer: \$ _____ [2]

22. (a) On the grid below, plot and join the following points.
 $A(0, 3)$ $B(2, 1)$ $C(4, 1)$ $D(5, 4)$.

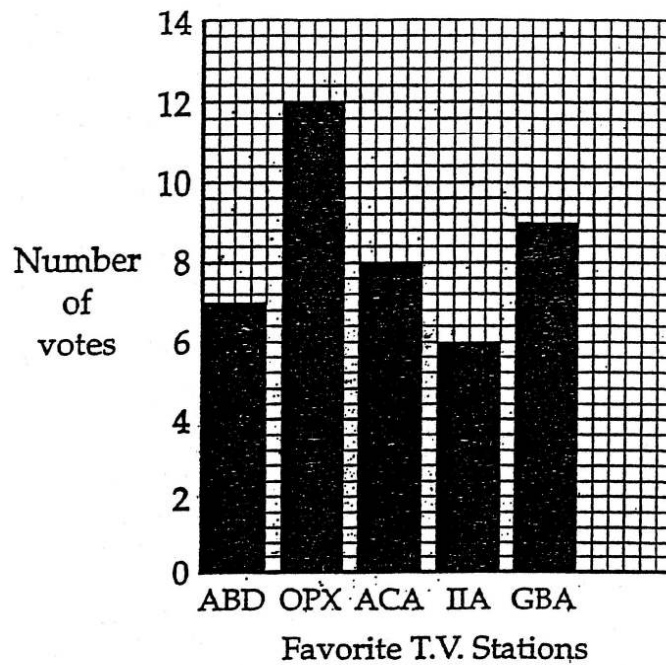


[5]

- (b) What is the geometrical name of the shape?

Answer: _____ [1]

23. The bar graph shows the results of a survey of viewers about their favourite T.V. Stations.



- (a) Which T.V. station received the most votes?

Answer: _____ [1]

- (b) How many persons voted for station OPX?

Answer: _____ [1]

- (c) Which station received 8 votes only?

Answer: _____ [1]

- (d) What is the difference in votes between station OPX and station GBA?

Answer: _____ [2]

- (e) How many persons voted altogether?

Answer: _____ [2]

24. George buys a compact disk for \$8.50 and sells it for \$15.30.

(a) Calculate

(i) the profit,

Answer: \$ _____ [2]

(ii) the percentage profit.

Answer: _____ % [2]

Mark borrowed \$1,500 from the bank at a rate of 8% per annum. The loan is to be repaid in 2 years.

(b) Calculate the

(i) Simple Interest,

Answer: \$ _____ [2]

(ii) total amount repaid.

Answer: \$ _____ [1]

MATHEMATICS

PAPER 2 (CORE/EXTENDED)

Thursday **17 JUNE 1999** 9.00 – 11.00 A.M.

Additional materials:

calculator

geometrical instruments

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS
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INSTRUCTIONS TO CANDIDATES

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Answer **ALL** questions in the answer booklet provided. **ALL** working must be shown.

ALL working must be done in blue or black ink.

INFORMATION FOR CANDIDATES

Calculators may be used. Geometrical instruments are required.

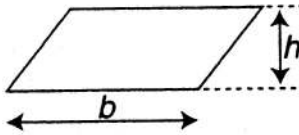
The mark for each question, or part question is shown in brackets [].

The total number of marks for this paper is 100.

INFORMATION AND FORMULAE

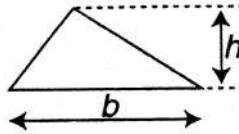
MENSURATION

Parallelogram



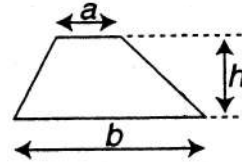
$$\text{Area} = bh$$

Triangle



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

Trapezium



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

Circle (radius r , diameter d)

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

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

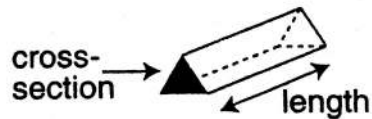
Cylinder (radius r , height h)

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

Prism

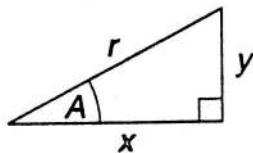
$$\text{Volume} = \text{area of cross-section} \times \text{length}$$

e.g. triangular prism

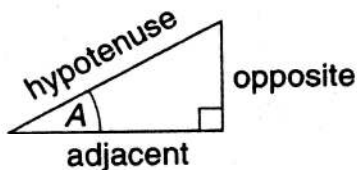


TRIGONOMETRY

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

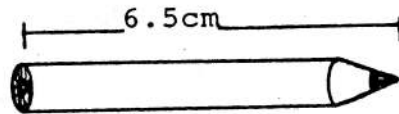
Standard form is $a \times 10^n$ where $1 \leq a < 10$ and n is an integer.

SECTION A

(44 marks)

Answer all questions in this section

1.



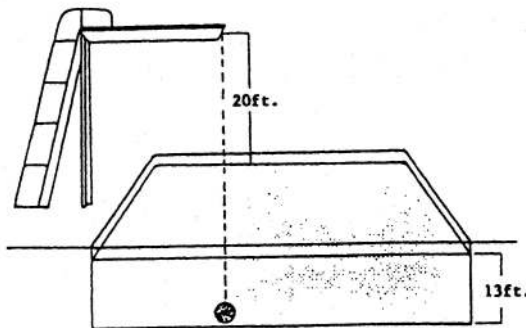
NOT TO SCALE

Tom's pencil is 6.5 cm long. Sally's pencil is 12 mm shorter.

How long is Sally's pencil?

[2]

2.



NOT TO SCALE

A diving board is 20 feet above the surface of a swimming pool which is 13 feet deep. A ball is dropped from the board perpendicularly into the pool. It sinks to the bottom and then rises to the surface. Calculate the total distance that the ball traveled.

[2]

3. Round 24.987 correct to:

(a) one decimal place

[1]

(b) two significant figures

[1]

(c) the nearest hundredth

[1]

4. When $a = 6$, $b = -2$ and $c = 0$, calculate the value of:

$$ac - 4b$$

[3]



5. Last week Tom bought a shirt on sale for \$26. This week, the regular price of the same shirt is \$40.

Calculate:

(i) his actual saving [1]

(ii) his saving as a percentage of the regular price [2]

6. A man divided \$240 among his three children in the ratio of 5:4:3.

Calculate the amount each child received. [3]

7. Solve the following pair of simultaneous equations:

$$3x + y = 10$$

$$x - y = 2$$

[4]

8. Write the correct symbols from the list $>$, $<$, $=$ that will make the statements true.

(i)	36%	0.36	[1]
(ii)	$1\frac{4}{5}$	1.75	[1]
(iii)	1.065	$1\frac{13}{20}$	[1]
(iv)	$\sqrt{1}$	1^2	[1]

-
9. The building code of an office requires a minimum floor area of 40 square feet per person.

- (a) Calculate the maximum number of people allowed to work in an office with a rectangular floor measuring 30 feet by 25 feet. [3]

When the ceilings are less than 10 feet high, the requirements are a minimum space of 400 cubic feet per person.

- (b) Calculate the maximum number of people allowed to work in an office measuring 20 feet by 18 feet by 9 feet. [3]

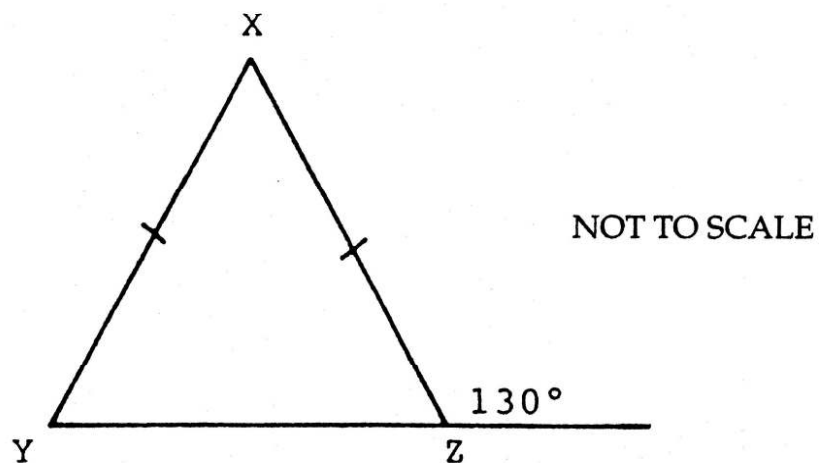
-
10. (a) Using a ruler and compass only, construct and label triangle ABC. AB = 7.2 cm, AC = 9.3 cm and BC = 7.8 cm. [4]
- (b) Measure and write down the size of angle ABC. [1]
- (c) Bisect line BC [2]

11. (a) Calculate the value of:

$$\frac{12.6 + 18.4}{3.4 \times 1.4}$$

[3]

- (b)



In $\triangle XYZ$, calculate the value of:

(i) $\widehat{XYZ}$

[2]

(ii) $\widehat{YXZ}$

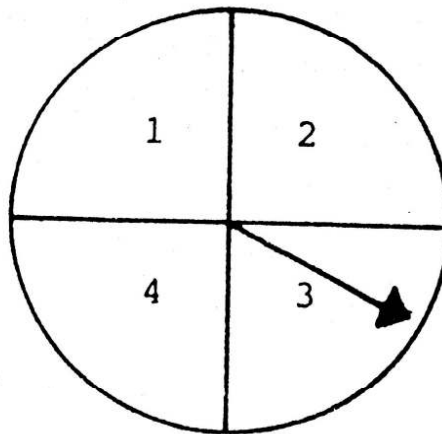
[2]

SECTION B

(56 marks)

ANSWER ALL QUESTIONS

12.



SPINNER

A fair spinner has the numbers 1, 2, 3 and 4. It is spun twice.

- (a) Copy and complete the table below to show **ALL** the possible outcomes when the spinner is spun twice.

		2nd. spin			
		1	2	3	4
1 st. spin	1		1, 2		1, 4
	2		2, 2	2, 3	
	3	3, 1			3, 4
	4	4, 1			4, 4

[2]

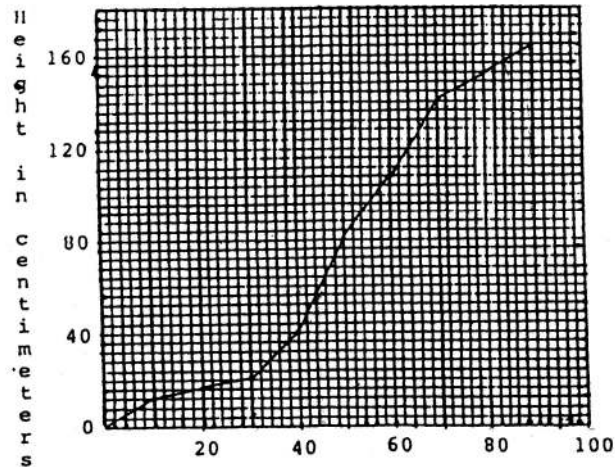
- (b) Use your table to calculate the probability of obtaining:

(i) a 3 followed by a 2 [1]

(ii) two prime numbers [2]

(iii) two consecutive numbers e.g. (1,2), (3,2) [2]

13. The graph shows the growth of a corn plant over a period of days.



Days of growth of a corn plant.

From the graph above, calculate:

- (a)
 - (i) the height of the corn plant after 30 days, [1]
 - (ii) the number of days after planting that the height reached 60 cm. [1]
- (b) During which 10 day period did the height increase
 - (i) the most, [2]
 - (ii) the least? [2]
- (c) How much higher was the corn plant after 90 days than after 60 days? [2]

14. (a) Calculate the value of:

$$3^{-2} \times 81^{\frac{1}{4}} \quad [3]$$

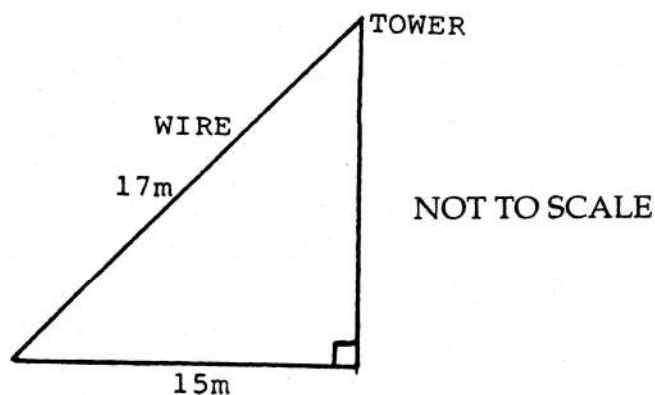
- (b) Solve for 'a'

$$2(3a - 4) = 13 \quad [3]$$

- (c) Factorise completely:

$$5x^3y^2 + 10x^2y^2 - 5xyz \quad [3]$$

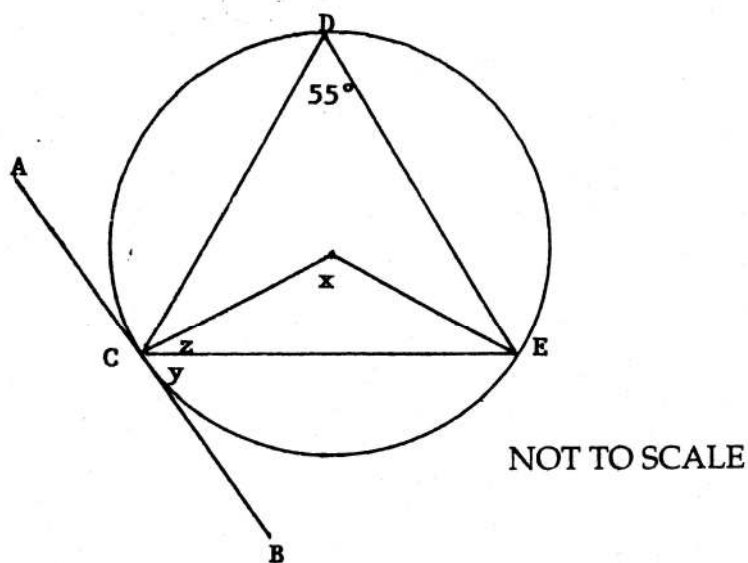
15. (a)



A taut wire 17 m long is attached to the top of a tower and the ground. The wire is 15 m away from the base of the tower.

- (i) Calculate the height of the tower. [3]
- (ii) Calculate the size of the angle formed between the ground and the wire. Give the answer to the nearest degree. [3]

(b)



AB is a tangent to the circle CDE, centre F, at C. Calculate the value of:

- (i) x [1]
- (ii) y [1]
- (iii) z [2]

16. Answer this entire question on the graph paper provided.
Given below are the tables of values for the equations
 $y = x - 5$ and $x + 2y = 2$.

$$y = x - 5$$

x	y
8	3
5	0
2	A
-1	-6

$$x + 2y = 2$$

x	y
8	-3
6	-2
2	B
-2	2

- (a) Calculate the value of:
- (i) A [1]
- (ii) B [1]
- (b) Using a scale of 1 cm to 1 unit on each axis, draw the graphs of the equations $y = x - 5$ and $x + 2y = 2$. [4]
- (c) Write down the coordinates of the point where the lines intersect. [2]
- (d) Calculate the gradient of the line $x + 2y = 2$. [2]

17. Answer this entire question on the graph paper provided.

- (a) Draw the axes for values of x and y from -6 to 10 . [1]
- (b) Draw and label the points $L(2,1)$; $M(4,2)$; $N(3,5)$ to form $\triangle LMN$. [2]
- (c) Reflect $\triangle LMN$ in the line $x = -1$ to form the image $\triangle L_1M_1N_1$. [3]
- (d) Rotate $\triangle LMN$ 90° clockwise about the origin. Name the image $\triangle L_2M_2N_2$. [2]
- (e) Using a scale factor of 2 and centre of enlargement $(0,0)$, enlarge $\triangle LMN$. Name the image $\triangle L_3M_3N_3$. [2]
- (f) Translate $\triangle LMN$ using a vector translation of $\begin{pmatrix} -7 \\ -6 \end{pmatrix}$. Name the image $\triangle L_4M_4N_4$. [2]

MATHEMATICS

PAPER 3 (EXTENDED)

Friday **18 JUNE 1999** 9.00 – 11.30 A.M.

Additional materials:

calculator

geometrical instruments

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS
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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 on each booklet.

Answer **ALL** questions in the answer booklet. **ALL** working must be shown.

ALL working must be done in blue or black ink.

INFORMATION FOR CANDIDATES

Calculators may be used.

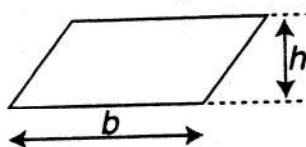
The mark for each question, or part question is shown in brackets [].

The total number of marks for this paper is 100.

INFORMATION AND FORMULAE

MENSURATION

Parallelogram



$$\text{Area} = bh$$

Circle (radius r , diameter d)

Cylinder (radius r , height h)

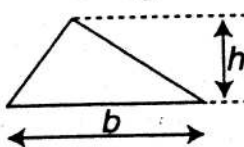
Sphere (radius r)

Prism

Pyramid

Cone (radius r , height h)

Triangle



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

Circumference

Area

Volume

Area of curved surface

Volume

Area of surface

Volume

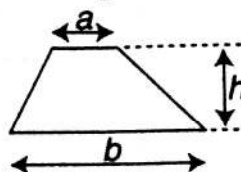
Volume

Volume

Volume

Area of curved surface

Trapezium



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

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

$$= \pi r^2$$

$$= \pi r^2 h$$

$$= 2\pi r h$$

$$= \frac{4}{3}\pi r^3$$

$$= 4\pi r^2$$

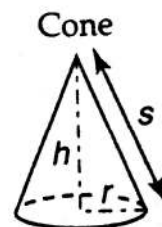
$$= \text{area of cross-section} \times \text{length}$$

$$= \frac{1}{3} \times \text{area of base} \times \text{height}$$

$$= \frac{1}{3}\pi r^2 h$$

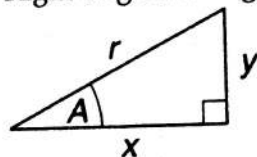
$$= \pi r s$$

$$\text{where } s = \text{slant height } \sqrt{h^2 + r^2}$$

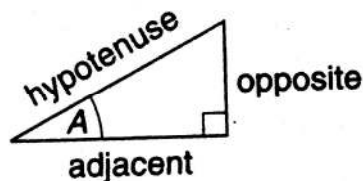


TRIGONOMETRY

Right-angled triangle

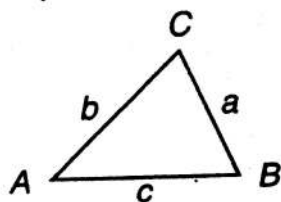


$$r^2 = x^2 + y^2 \text{ (result of Pythagoras)}$$



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

Any triangle



$$\text{In any triangle ABC: } \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc}$$

$$\text{Area of triangle ABC} = \frac{1}{2}ab \sin C$$

NUMBER ALGEBRA

Standard form is $a \times 10^n$ where $1 \leq n < 10$ and n is an integer.
The quadratic equation $ax^2 + bx + c = 0$ has solutions

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

The determinant of matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is $ad - bc$.

The inverse of $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is $\frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

If $y = ax^n$, then $\frac{dy}{dx} = anx^{n-1}$

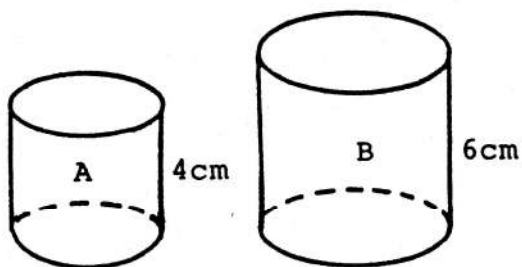
SECTION A

(52 Marks)

1. For the angle θ , $\cos \theta = 0$

Give the two possible values for θ in the range $0^\circ \leq \theta \leq 360^\circ$ [2]

2.

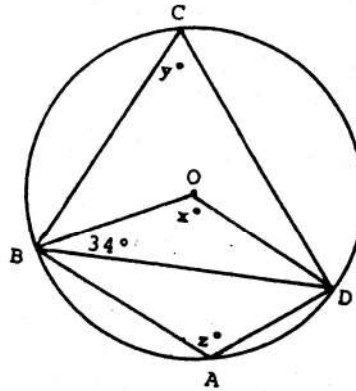


Two similar cylinders A and B have heights 4 cm and 6 cm respectively.

Calculate, in simplest form, the ratio of their:

- | | | |
|-----|---------------|-----|
| (a) | heights | [1] |
| (b) | surface areas | [1] |
| (c) | volumes | [1] |
-

3.



NOT TO
SCALE

The circle ABCD with centre O has $\widehat{BOD} = 34^\circ$

Find the value of:

- | | | |
|-----|---|-----|
| (a) | x | [1] |
| (b) | y | [1] |
| (c) | z | [1] |

4. Two sets D and F are such that $n(D) = 17$ and $n(F) = 22$.

- | | | |
|------|---|-----|
| (a) | Calculate | |
| (i) | the largest possible value of $n(D \cap F)$ | [1] |
| (ii) | the smallest possible value of $n(D \cup F)$ | [1] |
| (b) | If $n(D \cap F) = 5$, calculate $n(D \cup F)$ | [1] |
| (c) | If $n(D \cup F) = 29$, calculate $n(D \cap F)$ | [1] |

5. The height, h , of a container varies inversely as the area, A , of the base.

If $h = 6$ when $A = 60$, calculate h when $A = 15$. [4]

6. (a) $MB = \begin{pmatrix} 8 & 4 \end{pmatrix}$.

B is a matrix of order 2×2 .

State the order of matrix M.

[1]

(b)
$$\begin{pmatrix} 2 & 0 \\ 1 & -1 \end{pmatrix} \begin{pmatrix} X \\ Y \end{pmatrix} = \begin{pmatrix} 4 \\ 3 \end{pmatrix}$$

Calculate the values of X and Y.

[3]

7. (a) Make t the subject of the formula

$$v = u + ft^2$$

[3]

(b) Factorize the numerator and denominator of the following fraction and thus simplify it.

$$\frac{4x + 6}{4x^2 - 9}$$

[3]

8. Every time Brinkley shoots a free throw in a basketball game, the probability that he will score a point is 0.8.

When he shoots two free throws, calculate the probability that he:

(a) scores both, [1]

(b) misses both, [2]

(c) scores one and misses one. [3]

9. (a) Express as a single fraction in its lowest terms

$$\left(\frac{b}{4}\right)^2 \times \left(\frac{b}{2}\right)^{-3}$$

[3]

(b) Given that $p = 4 \times 10^{-3}$, calculate p^2 , giving your answer in standard form. [3]

10. You are given the fraction $\frac{x}{y}$

When 3 is added to the denominator, the fraction becomes $\frac{1}{3}$

- (a) (i) Write an equation to represent this fact. [1]
(ii) Show the equation reduces to $3x = y + 3$. [1]

When 2 is subtracted from the denominator, the fraction becomes $\frac{1}{2}$

- (b) Write an equation to represent this fact. [1]
(c) Solve for x and y . [4]
-

11. The functions h and k are defined as

$$h(x) = 7 - 2x$$

$$k(x) = x + 6$$

- (a) State the value of $h(3)$. [1]
(b) Calculate the value of x for which
 $k(x) = 5$ [1]
(c) Find $k^{-1}: x \rightarrow$ [1]
(d) Find and simplify an expression for $hh: x \rightarrow$ [2]
(e) Calculate the values for which $h(x) \leq k(x)$ [2]

SECTION B

(48 Marks)

Answer **ALL** questions in this section.

Each question carries 12 marks.

12. The following is a table of values for a curve.

X	-1	0	1	2	3	4	5	6	7
Y	12	5	0	-3	-4	-3	0	9	12

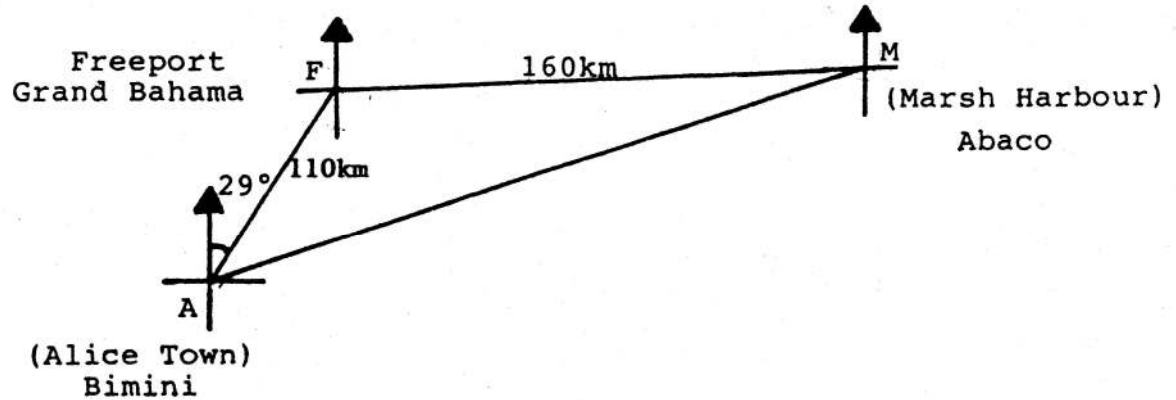
- (a) Use a scale of 2 cm = 1 unit on the x-axis and 1 cm = 1 unit on the y-axis to draw the graph of the curve. [4]

The curve is a parabola.

Therefore one of the points of the graph is incorrect.

- (b) Write the coordinates of
- (i) the incorrect point, [1]
 - (ii) the corrected point [1]
- (c) Using the solutions for $y = 0$, or otherwise, write and simplify the equation of the parabola. [3]
- (d) (i) Draw the tangent to the curve at the point (2, -3). [1]
- (ii) Calculate the gradient at this point. [2]

13.



Freeport is 110 km from Alice Town on a bearing of 029° .

- (a) Calculate the bearing of Alice Town from Freeport [1]

Marsh Harbour is 160 km due east of Freeport.

- (b) Calculate, to the nearest whole number,
- (i) the angle AFM, [1]
 - (ii) the distance between Marsh Harbour and Alice Town, [4]
 - (iii) the angle FAM. [3]

An airplane leaves Alice Town at 4:45 p.m. and flies to Marsh Harbour at an average speed of 180 km/h.

- (c) Calculate the time of arrival of the airplane in Marsh Harbour. [3]

14. The results of 800 candidates in a National Mathematics exam is as follows:

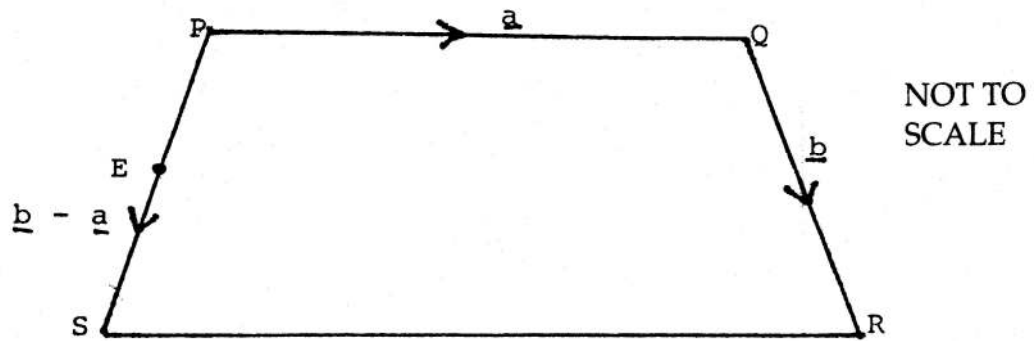
% MARK	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
No. of Candidates	5	19	66	216	252	102	72	41	18	9

- (a) Copy and complete the following cumulative frequency table. [2]

% MARK	CUMULATIVE FREQUENCY
10 or less	5
20 or less	24
30 or less	90
40 or less	306
50 or less	
60 or less	
70 or less	
80 or less	
90 or less	
100 or less	

- (b) Using a horizontal scale of 1 cm to represent 10%, and a vertical scale 2 cm to represent 100 candidates, draw and label a cumulative frequency curve for these results. [4]
- (c) From your graph, estimate:
- (i) the median mark [1]
 - (ii) the interquartile range [3]
 - (iii) the pass mark if 70% of the candidates were successful [2]

15. (a)



In the figure PQRS, $\vec{PQ} = \underline{a}$, $\vec{QR} = \underline{b}$ and $\vec{PS} = \underline{b} - \underline{a}$.

E is the mid-point of PS.

Express the following in terms of $\underline{a}$ and/or $\underline{b}$, simplifying your answers.

(i) $\vec{EP}$ [2]

(ii) $\vec{SR}$ [2]

(iii) $\vec{ER}$ [2]

State **TWO** geometrical properties of PQ and SR [2]

(b) $\vec{OA} = \begin{pmatrix} 4 \\ -2 \end{pmatrix}$ and $\vec{OB} = \begin{pmatrix} 10 \\ 6 \end{pmatrix}$.

(i) Write $\vec{AB}$ as a column matrix. [2]

(ii) Calculate $|\vec{AB}|$, the magnitude of $\vec{AB}$. [2]