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MATHEMATICS

PAPER 1 (CORE/EXTENDED) 3815/1

Tuesday **17 MAY 2016** 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

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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

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Tracing paper may be used.

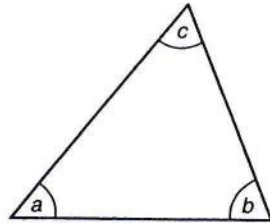
Geometrical instruments are required.

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

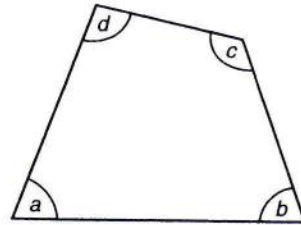
The total number of marks for this paper is 100.

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

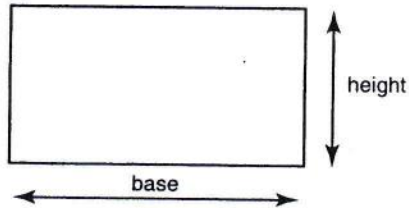
INFORMATION AND FORMULAE



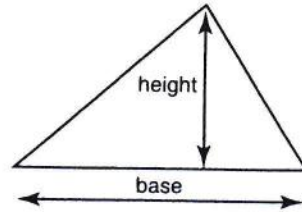
Angle sum of triangle
 $a + b + c = 180^\circ$



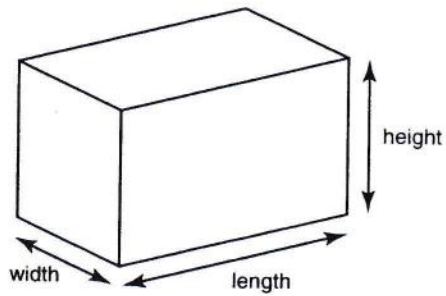
Angle sum of quadrilateral
 $a + b + c + d = 360^\circ$



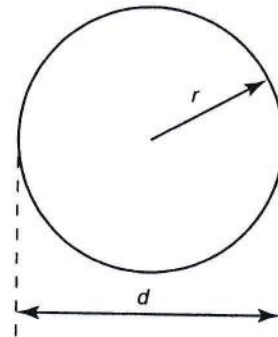
Area of rectangle = base $\times$ height



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. At a weather station, a balloon is released every 6 hours, day and night. Calculate the number of balloons that are released in one week.

Answer: _____ [2]

2. Given that $x = 7$ and $y = -4$, calculate the value of $x^2 + 3y$.

Answer: _____ [3]

3. Calculate the remainder when the sum of 486 and 985 is divided by 83.

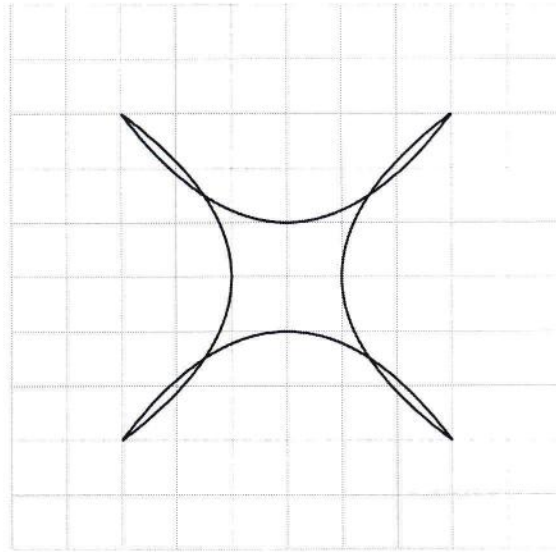
Answer: _____ [3]

4. Simplify

$$19 - 2(3 + 9) \div 4$$

Answer: _____ [3]

5. On the diagram below, draw in **all** the lines of symmetry.



[3]

6.



Coffee Break prepares a blend of coffee containing Arabica beans and Brazil beans in the ratio 4 : 3.

- (a) Calculate the weight of Arabica beans in a blend of 455 g.

Answer: _____ g [2]

Coffee Break has placed an order of 150 kg of Brazil beans.

- (b) Calculate the weight of Arabica beans to be ordered to make their blend.

Answer: _____ kg [2]

9. Mr. Rolle attended a tourist conference session beginning at 8:45 a.m. and ending at 11:05 a.m.

(a) How long was the session?

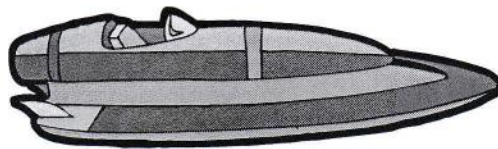
Answer: _____ hrs [2]

Mr. Rolle then had a 55 minute lunch break.

(b) At what time did the lunch break end?

Answer: _____ [2]

10.



A power boat in a *Formula 2* race has an average speed of 165 km per hour.

Calculate

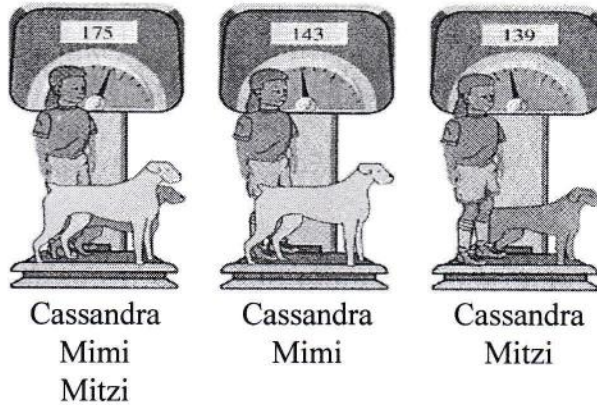
(a) the distance, in km, that the boat travelled in a race of $1\frac{2}{3}$ hours,

Answer: _____ km [2]

(b) the time, in minutes, to travel a lap of 5.5 km.

Answer: _____ mins [3]

11.



Cassandra needs to determine the weight of her two dogs, Mimi and Mitzi. However, neither dog will sit on the scale by herself. Cassandra, Mimi and Mitzi altogether weigh 175 pounds. Cassandra and Mimi together weigh 143 pounds. Cassandra and Mitzi together weigh 139 pounds.

Calculate:

(a) the weight of Mitzi,

Answer: _____ lbs [2]

(b) the weight of Mimi,

Answer: _____ lbs [2]

(c) the weight of Cassandra.

Answer: _____ lbs [2]

15. In a survey, people were asked which of three newspapers they read. The incomplete table below shows the results of this survey.

Newspaper	Number of People	Angle
<i>The Daily</i>	60	120°
<i>The Sun</i>	50	
<i>The Press</i>		140°

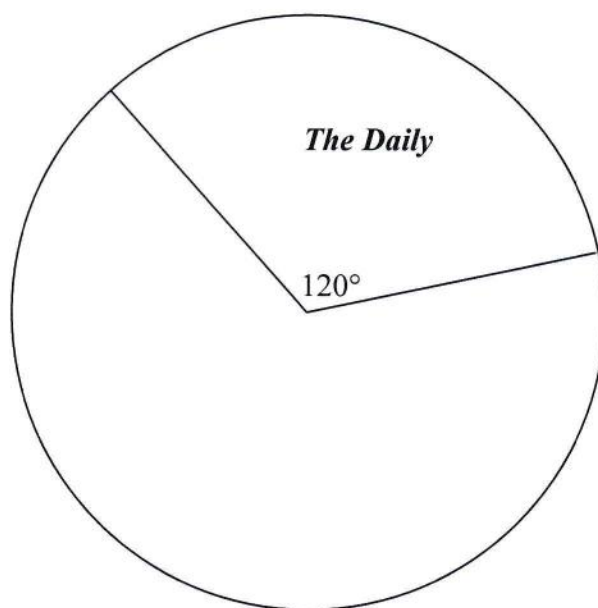
- (a) Calculate
- (i) the angle representing *The Sun*,

Answer: _____ $^\circ$ [2]

- (ii) the number of people who read *The Press*.

Answer: _____ [3]

- (b) With a protractor and ruler, use the information from (a) to complete the pie chart below.



16.



The Shoe Store for men sold 8 pairs of shoes. The shoe sizes sold were:

$8\frac{1}{2}$, $10\frac{1}{2}$, 9, $10\frac{1}{2}$, 7, 6, 10, $10\frac{1}{2}$

(a) Calculate

(i) the mean of the shoe sizes,

Answer: _____ [2]

(ii) the median shoe size.

Answer: _____ [3]

(b) Write down the modal shoe size.

Answer: _____ [1]

(c) Write down the measurement that is most useful to the store manager.

Answer: _____ [1]

17. Simplify

(a) $\frac{1}{2}(3-2x)$

Answer: _____ [2]

(b) $19s - 6t - s + 5t$

Answer: _____ [2]

(c) $5w \times w^3 \times 3$

Answer: _____ [2]

(d) $24p^7 \div 3p^2$

Answer: _____ [2]

18. (a) Restaurants add a gratuity of 15% to the diner's bill. Calculate the gratuity for a bill of \$67.50, giving your answer to the nearest cent.

Answer: \$ _____ [3]

(b) The regular price of a purse is \$159. The sale price is \$106. Calculate the percentage saving.

Answer: _____ % [3]

(c) A savings account earns interest of 2.5% per year. Calculate the interest earned on \$840 in 6 months.

Answer: \$ _____ [3]

19. Linda is paid \$12.40 per hour for the first 36 hours of a regular work week. Overtime is paid at time and a half. This week she worked 42 hours.

(a) Calculate her earnings for

(i) the regular 36 hours worked,

Answer: \$ _____ [1]

(ii) one hour overtime,

Answer: \$ _____ [2]

(iii) her total earnings for this week.

Answer: \$ _____ [3]

Last week Linda's total earnings were \$465. The employee National Insurance contribution was 3.4% of the total earnings.

(b) Calculate

(i) her National Insurance contribution for last week,

Answer: \$ _____ [2]

(ii) her net earnings.

Answer: \$ _____ [1]

MATHEMATICS

PAPER 2 (CORE/EXTENDED) 3815/2

Wednesday **18 MAY 2016** 9:00 A.M.–11:00 A.M.

Additional materials:

Calculator (not graphing)

Geometrical instruments

Answer booklet

Graph paper

MINISTRY OF EDUCATION NATIONAL EXAMINATIONS
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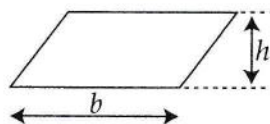
The mark for each question, or part question, is shown in brackets [].

The total number of marks for this paper is 100.

INFORMATION AND FORMULAE

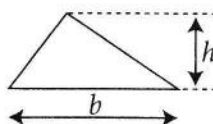
MENSURATION

Parallelogram



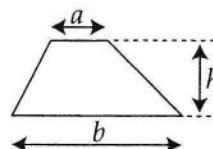
$$\text{Area} = bh$$

Triangle



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

Trapezium



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

Circle (radius r , diameter d)

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

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

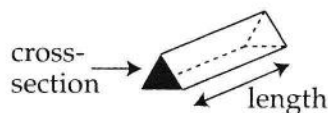
Cylinder (radius r , height h)

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

Prism

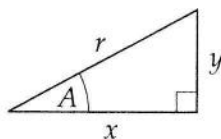
$$\text{Volume} = \text{area of cross-section} \times \text{length}$$

e.g. triangular prism

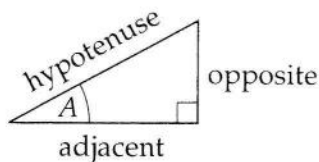


TRIGONOMETRY

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.

1. Express this ratio in its simplest form.

$$96 \text{ cm} : 2.4 \text{ m}$$

[2]

2. Light travels at 1.86×10^5 miles per second. Calculate how far it travels in a minute, giving your answer in scientific notation (standard form).

[2]

3. Solve $\frac{x}{3} - \frac{7}{12} = \frac{x}{4}$

[4]

4. (a) Solve the inequality $9 + 11x < 42$

[2]

- (b) Write down the solution set of **natural numbers** that satisfy the inequality in (a).

[2]

5. Evaluate

(a) 5^3

[1]

(b) 9°

[1]

(c) $(2^3)^2$

[1]

(d) 4^{-2}

[1]

6. Jerry had \$100. He went to a Computer Store, a Book Store and a Music Store. He spent three times as much money in the Computer Store as he did at the Music Store. He spent \$12 less at the Book Store than at the Music Store. He then had \$37 left.

- (a) Using x to represent the amount he spent at the Music Store, express in terms of x ,

- (i) the amount spent at the Computer Store,

[1]

- (ii) the amount spent at the Book Store.

[1]

- (b) Form an equation in terms of x for the total amount of money spent.

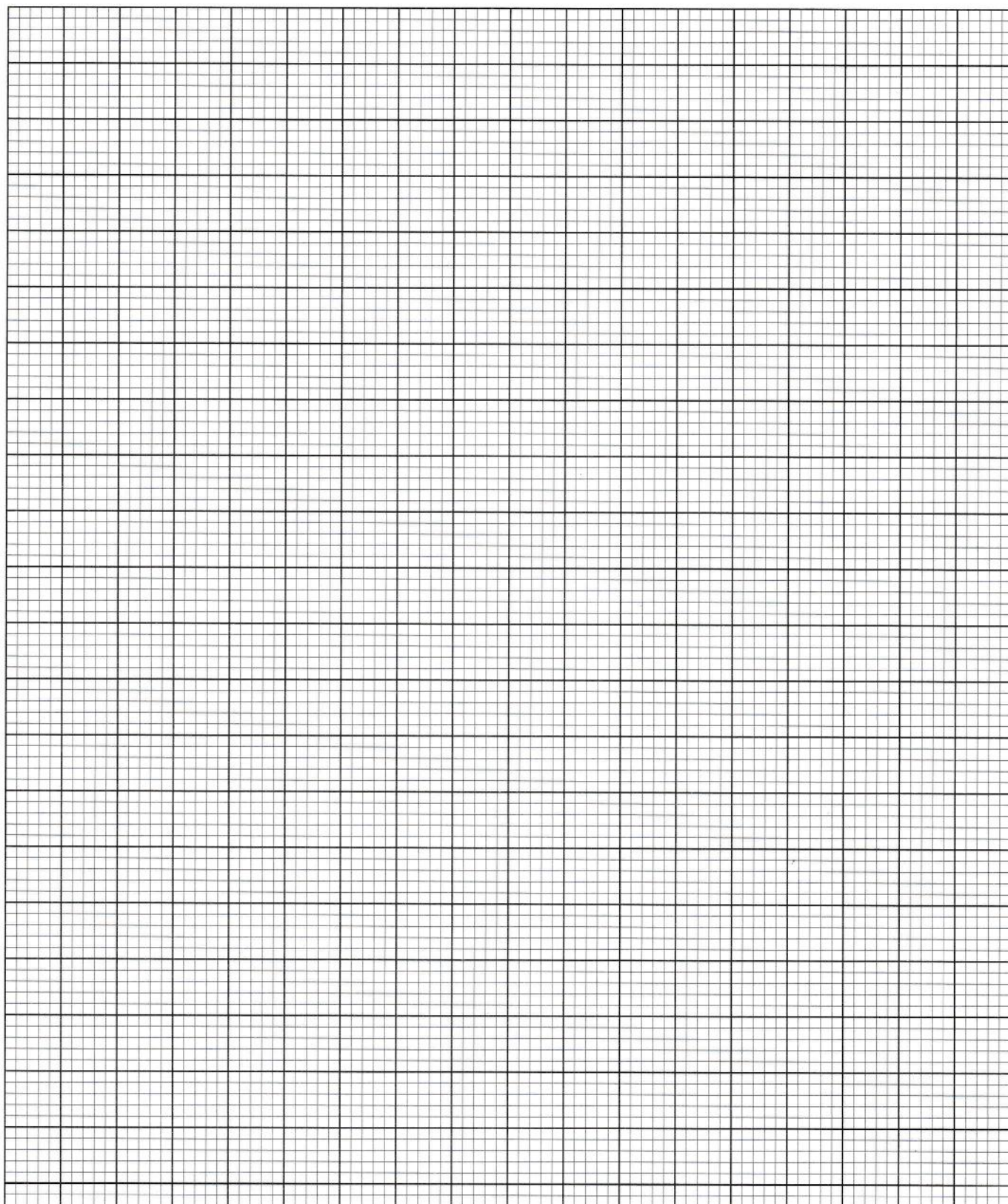
[1]

- (c) Solve the equation formed in (b) to determine the amount of money spent at the Music Store.

[2]

MATHEMATICS GRAPH PAPER**MINISTRY OF EDUCATION****AB7****BAHAMAS GENERAL CERTIFICATE OF SECONDARY EDUCATION
EXAMINATION**

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Surname & Initials:		Section:	
Signature:	Date:	Qu. No.	



7. Solve the following pair of simultaneous equations

$$y = \frac{3}{2}x$$

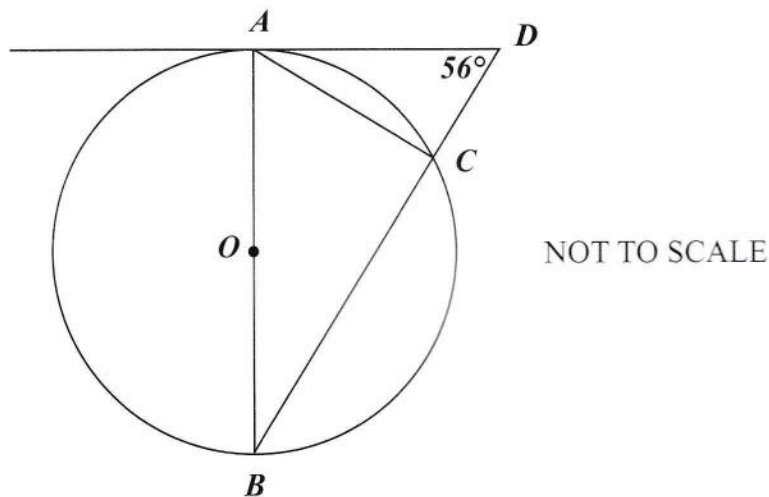
$$3x + 2y + 4 = 0$$

[5]

8. (a) **Using a ruler, compass and pencil only**, construct and label $\triangle ABC$ such that $AB = 11.2$ cm, $AC = 9$ cm and $\angle CAB = 60^\circ$. [5]

- (b) Measure and write down the size of $\angle ABC$. [1]

9. (a) **AB is a diameter of the circle ABC with centre O . AD is a tangent to the circle at A . $\angle ADC = 56^\circ$.** [1]



- Calculate (i) $\angle BCA$, [1]

- (ii) $\angle ABD$, [1]

- (iii) $\angle CAD$. [1]

- (b) Each interior angle of a regular polygon is 165° .

Calculate

- (i) the size of each exterior angle, [1]

- (ii) the number of sides of the polygon. [2]

10. Use the formula $Q = 3t^2 - 5th$ to

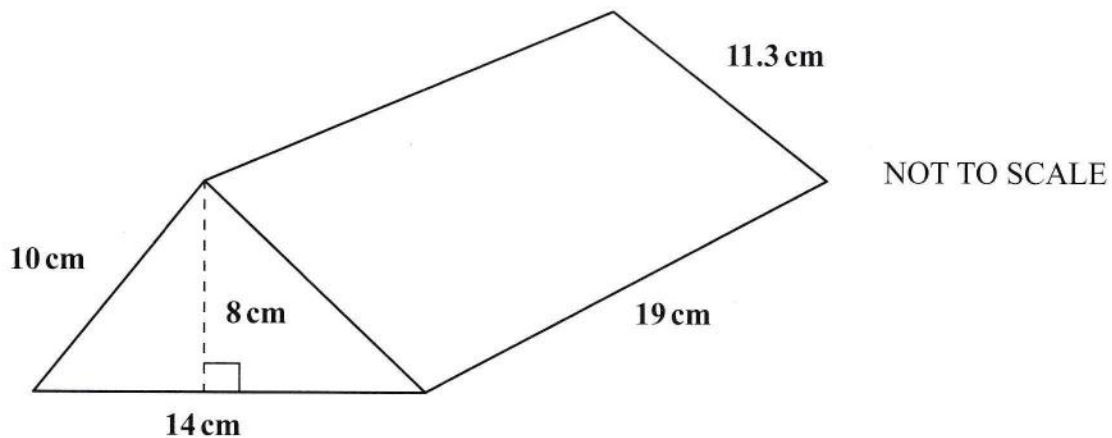
(a) calculate the value of

(i) Q when $t = 7$ and $h = 6$, [2]

(ii) h when $Q = 332$ and $t = 16$, [3]

(b) make h the subject of the formula. [2]

11. The diagram represents a triangular prism of length 19 cm. The triangular cross-section has sides of length 10 cm, 11.3 cm and 14 cm, and a height of 8 cm.



Calculate

(a) the area of the cross-section, [2]

(b) the volume of the prism, [2]

(c) the total surface area of the prism. [3]

12. $\mathcal{E} = \{\text{positive numbers less than } 30\}$
 $L = \{\text{positive multiples of } 2 \text{ less than } 30\}$
 $M = \{\text{positive multiples of } 3 \text{ less than } 30\}$
 $N = \{\text{positive multiples of } 5 \text{ less than } 30\}$

(a) List the elements of

(i) L , [1]

(ii) M , [1]

(iii) N , [1]

(iv) $L \cap N$, [1]

(v) $M' \cap N$. [2]

(b) Determine $n(L \cup N)$. [1]

(c) Describe the set $L \cap M$ in a similar manner as the descriptions given for the sets L , M and N . [1]

13. (a) Factorise completely

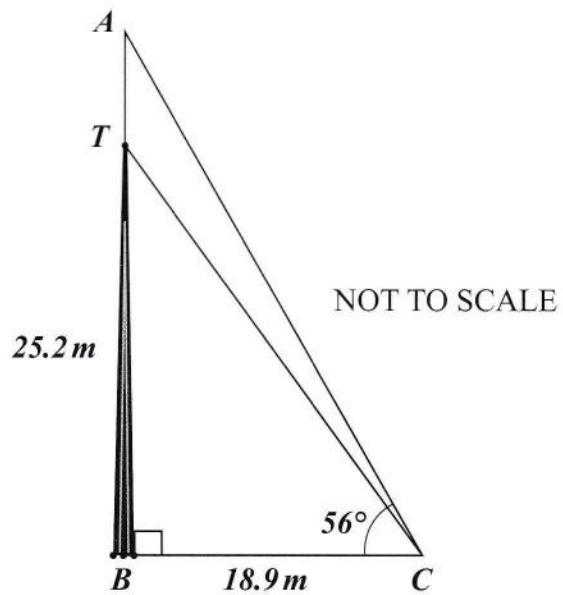
$$12pq^2 + 3p - 6p^2q \quad [3]$$

(b) Simplify

(i) $\left(\frac{5m}{n^3}\right)^2$ [3]

(ii) $13 - 3(t + 5) + 4t$ [3]

14. The diagram shows transmission tower TB of height 25.2 m topped with an antenna AT . The point C is 18.9 m from B and the angle of elevation at C to the top of the antenna is 56° .



Calculate, giving your answer correct to one decimal place,

- | | | |
|-----|-----------------------------------|-----|
| (a) | the length of TC , | [3] |
| (b) | the angle, BTC , | [3] |
| (c) | the height of the antenna, AT . | [4] |
-

15. **ANSWER THIS ENTIRE QUESTION ON THE GRAPH PAPER PROVIDED.**

- (a) Copy and complete the following table for the graph of $y = \frac{2x-1}{3}$.

x	-7	-2.5	-1	2	8
y	-5		-1	1	

[2]

- (b) Using a scale of 1 cm to 1 unit for each axis, and values $-8 \leq x \leq 10$ and $-8 \leq y \leq 10$, draw the graph of the line $y = \frac{2x-1}{3}$.

[3]

- (c) Calculate the gradient (slope) of your graph in (b).

[2]

- (d) Another graph has the equation $y = 3$. Draw this graph on the same coordinate plane.

[1]

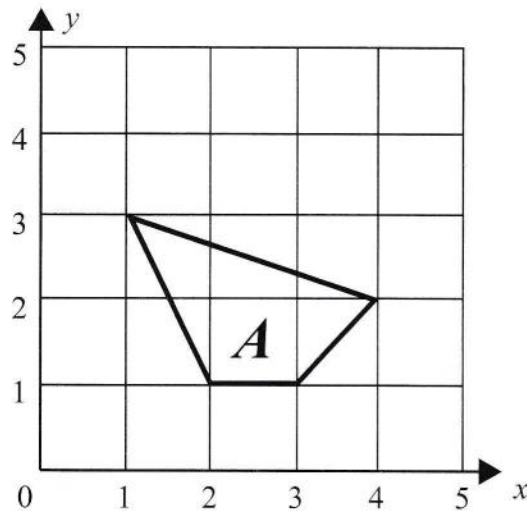
- (e) Write down the gradient (slope) of the graph in (d).

[1]

- (f) Write down the coordinates of the point where the graphs intersect.

[1]

16. ANSWER THIS ENTIRE QUESTION ON THE GRAPH PAPER PROVIDED.



- (a) Using a scale of 1 cm to represent 1 unit on each axis, taking values of x from $-8 \leq x \leq 10$ and values of y from $-8 \leq y \leq 10$, copy and draw the above quadrilateral A . [3]
 - (b) Draw the image of quadrilateral A after a rotation of 180° about the origin. Label it B . [2]
 - (c) Translate quadrilateral A by $\begin{pmatrix} 1 \\ -5 \end{pmatrix}$. Label the image C . [2]
 - (d) Reflect quadrilateral A in the line $x = -1$. Label the image D . [2]
 - (e) Enlarge quadrilateral A by a scale factor of 2 through the origin. Label the image E . [2]
-

MATHEMATICS

PAPER 3 (CORE/EXTENDED) 3815/3

Monday **23 MAY 2016** 9:00 A.M.–11:30 A.M.

Additional materials:

Calculator (not graphing)

Geometrical instruments

Answer booklet

Graph paper

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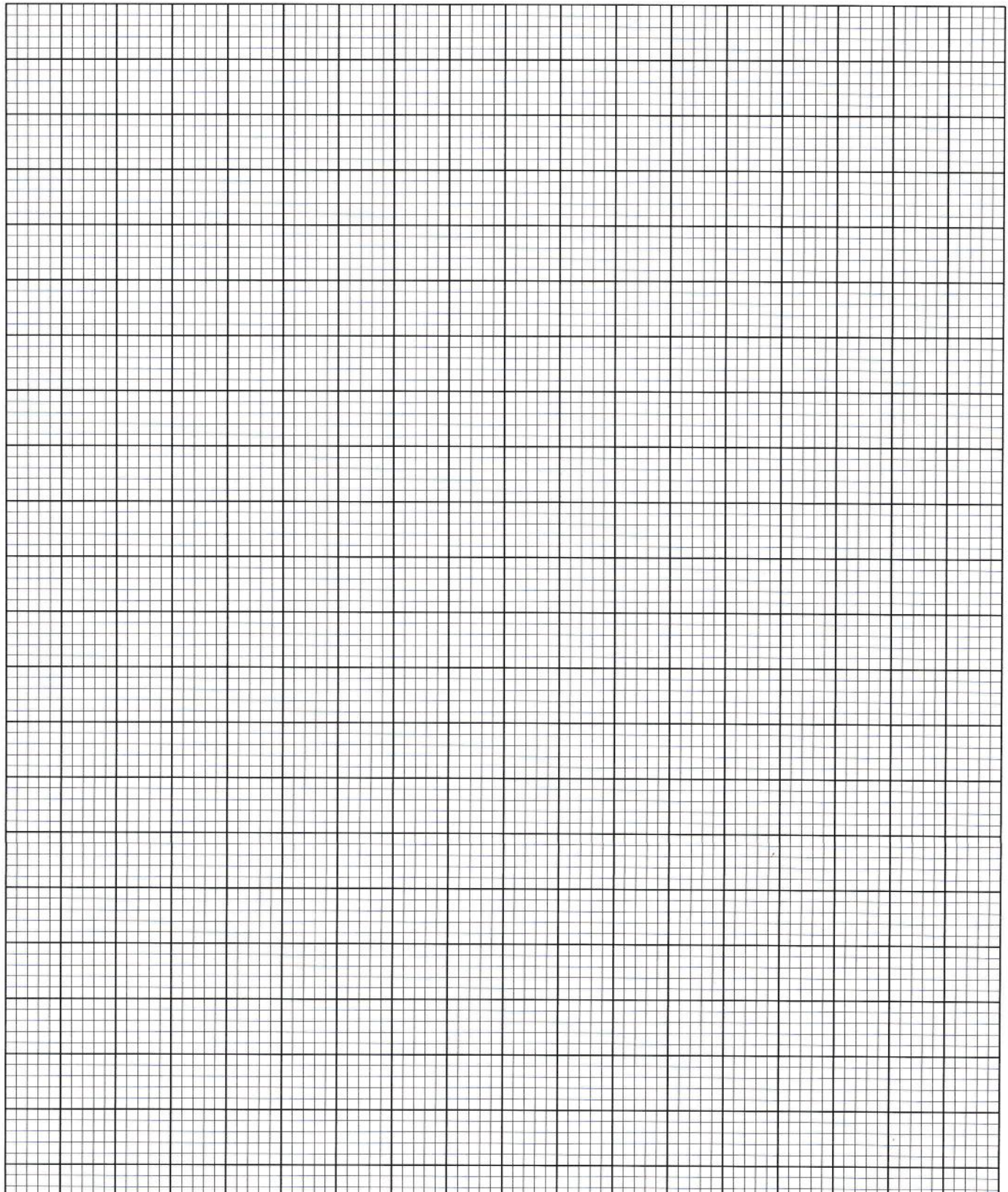
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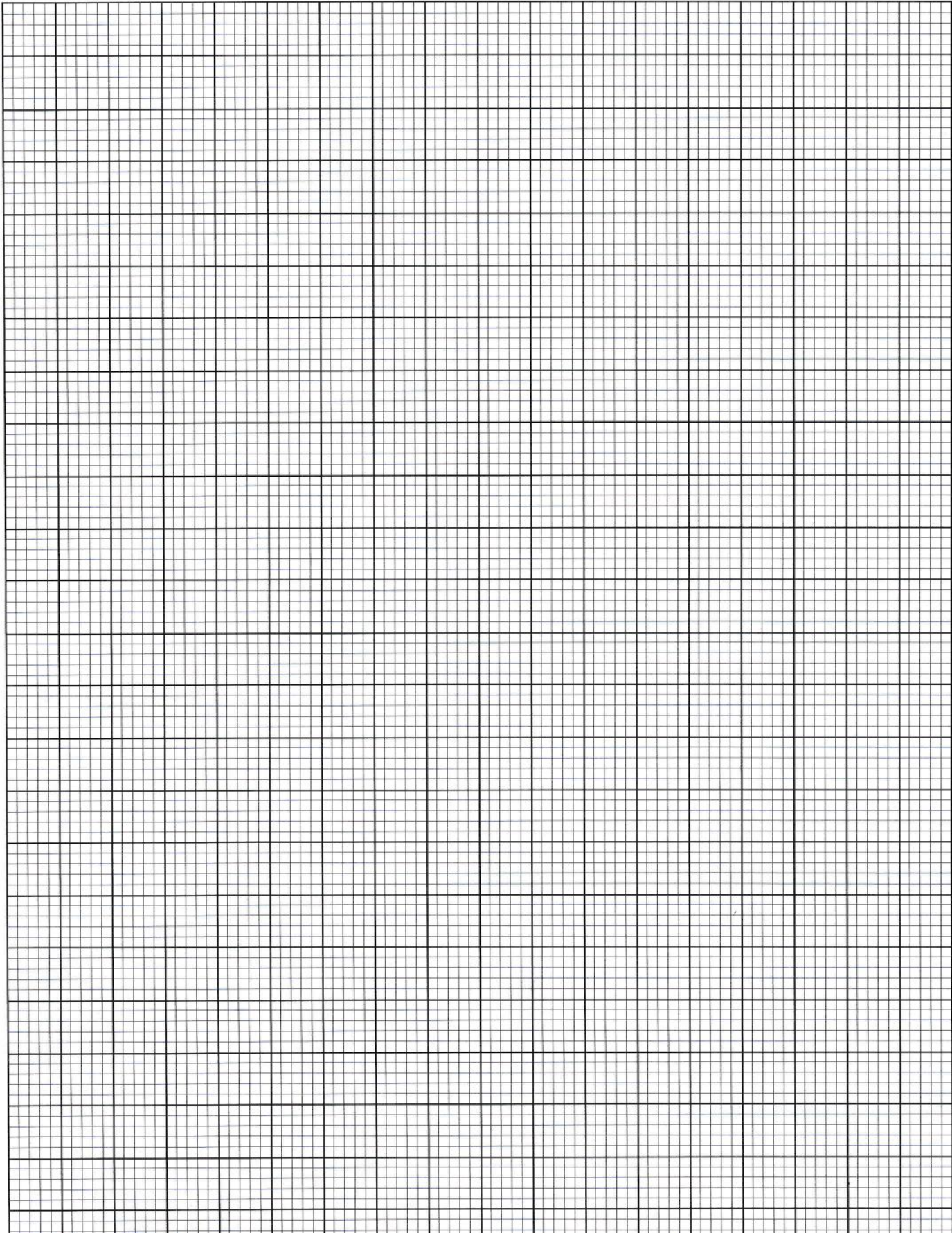
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EXAMINATION**

School No.	Candidate No.	Level:	For Examiner's Use
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EXAMINATION

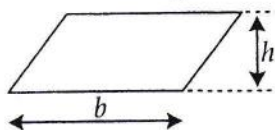
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Surname & Initials:		Section:	
Signature:	Date:	Qu. No.	



INFORMATION AND FORMULAE

MENSURATION

Parallelogram



$$\text{Area} = bh$$

Circle (radius r , diameter d)

Cylinder (radius r , height h)

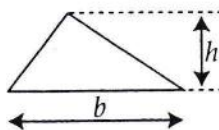
Sphere (radius r)

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

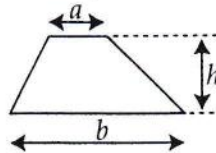
Volume

Volume

Volume

Area of curved surface

Trapezium



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

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

$$= \pi r^2$$

$$= \pi r^2 h$$

$$= 2\pi r h$$

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

$$= 4\pi r^2$$

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

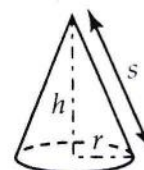
$$= \frac{1}{3} \times \text{area of base} \times \text{height}$$

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

$$= \pi r s$$

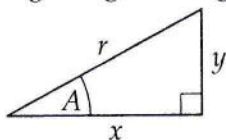
$$\text{where } s = \text{slant height } \sqrt{h^2 + r^2}$$

Cone

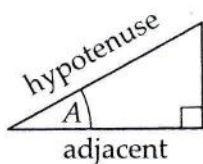


TRIGONOMETRY

Right-angled triangle

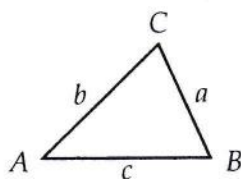


$$r^2 = x^2 + y^2 \text{ (result of Pythagoras)}$$



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

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

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

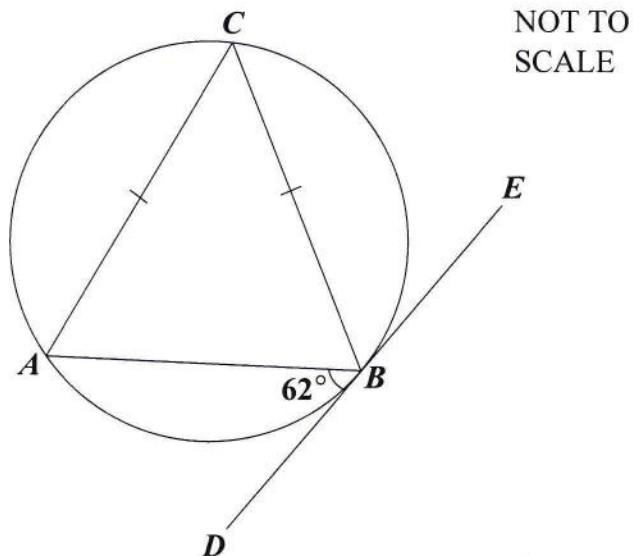
The determinant of matrix $\begin{pmatrix} a & b \\ c & d \end{pmatrix}$ is $ad - bc$.

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 $\frac{dy}{dx} = anx^{n-1}$

1. In the diagram, the line DE is tangent to the circle ABC at the point B .

$AC = BC$ and $\angle ABD = 62^\circ$.



Calculate the value of

- | | | |
|-----|----------------|-----|
| (a) | $\angle ACB$, | [1] |
| (b) | $\angle BAC$, | [1] |
| (c) | $\angle CBE$. | [1] |

2. In the formula $\frac{k}{x^3}$, k is a constant. If $y = 4$ when $x = 6$, calculate

- | | | |
|-----|---------------------------------|-----|
| (a) | the value of k , | [2] |
| (b) | the value of y when $x = 4$. | [2] |

3. (a) Simplify $(16b^8)^{\frac{3}{4}}$ [2]
- (b) Solve for x $9^{2x} = 27$ [3]

4. The estimated number of tourist arrivals for this year is 5.355 million. This is an increase of 5% from last year.

(a) Calculate the number of tourist arrivals for last year. [2]

The projected number of tourist arrivals for next year is 5.5692 million.

(b) Calculate the projected percentage increase for tourist arrivals. [3]

5. (a) For the following matrix equation, solve for k , m and n .

$$\begin{pmatrix} m & 0 \\ 1 & 4 \end{pmatrix} + k \begin{pmatrix} 0 & 3 \\ -2 & 1 \end{pmatrix} = \begin{pmatrix} 3 & 12 \\ n & 8 \end{pmatrix} \quad [3]$$

(b) Given that the matrix $\begin{pmatrix} x & 1 \\ 2 & 3 \end{pmatrix}$ does not have an inverse, calculate the value of x . [3]

6. $\overrightarrow{OA}$ and $\overrightarrow{OB}$ are position vectors relative to the origin O . Given the points $A(7, -15)$ and $B(-2, 3)$,

(a) write down the column vectors $\overrightarrow{OA}$ and $\overrightarrow{OB}$, [2]

(b) express $\overrightarrow{AB}$ as a column vector, [2]

(c) calculate $|\overrightarrow{AB}|$, the magnitude of $\overrightarrow{AB}$. [2]

7. Given that $h(t) = 7 - 5t$ and $k(t) = \frac{4+t}{3}$, calculate

(a) the value of $h(3)$, [1]

(b) t where $k(t) = 9$, [2]

(c) a simplified expression for $kh(t)$, [2]

(d) $k^{-1}(t)$. [2]

8. (a) Express as a fraction in simplest form.

$$\frac{3}{x-1} - \frac{2}{3-x}$$

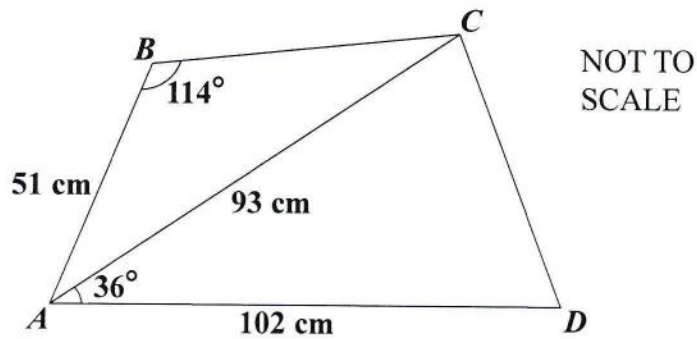
[4]

- (b) Solve for x .

$$\frac{1}{x} - \frac{1}{2x} + \frac{1}{3x} = 1\frac{2}{3}$$

[4]

9.



For the quadrilateral $ABCD$, $AB = 51$ cm, $AD = 102$ cm and $AC = 93$ cm.
 $\angle ABC = 114^\circ$ and $\angle CAD = 36^\circ$.

Calculate, giving your answer to the nearest whole number,

- (a) the length of CD ,

[4]

- (b) the angle $\angle ACB$.

[4]

10. In a club with 30 members, 18 are girls, 6 are left-handed and 3 are left-handed boys. The table is to show the number of members in each category.

	Left-handed	Right-handed
Girls		15
Boys	3	

- (a) Copy and complete the table. [2]
- (b) A member is chosen at random. Use your table to calculate the probability that the member is
- (i) left-handed, [1]
- (ii) a boy, [1]
- (iii) a girl and right-handed. [1]
- (c) The president of the club is right-handed. Calculate the probability that the president is a boy. [2]
- (d) Two members are chosen, one after the other, to represent the club. Calculate the probability that they are
- (i) both right-handed, [2]
- (ii) a boy and a girl, in any order. [3]
-

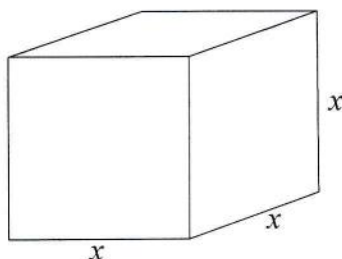
11. **ANSWER THIS ENTIRE QUESTION ON THE GRAPH PAPER PROVIDED.**

The following is an incomplete table of values for the graph of $y = 3 + \frac{2}{x}$.

x	0.4	0.5	1		2	3	4	5	6
y	8	7	5	4.5	4	3.7		3.4	3.3

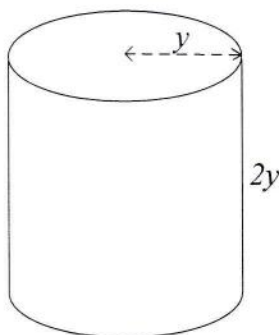
- (a) Calculate
- (i) the missing y value, [1]
- (ii) the missing x value. [3]
- (b) Using a scale of 2 cm to 1 unit on each axis for $0 \leq x \leq 7$ and $0 \leq y \leq 9$, draw the graph of $y = 3 + \frac{2}{x}$. [4]
- (c) Using the same scale and axes, draw the graph of $y = 7 - x$. [2]
- (d) From your graph, estimate the values of x where the curve and line intersect. [2]
-

12. A manufacturing company ships material in quantities of 8000 cm^3 by volume. The material is shipped in cubic packaging as shown.



- (a) For this cube, calculate
- (i) the length of a side, [2]
 - (ii) the surface area. [2]

In the interests of economy, it was found that it would be cheaper to use cylindrical packaging as shown.



- (b) For this cylinder, calculate, using $\pi = 3.14$ where necessary,
- (i) the radius (to 1 decimal place), [3]
 - (ii) the surface area. [4]
- (c) Calculate the amount of packaging saved by using the cylindrical form. [1]

13. The general expression for a trinomial is $ax^2 + bx + c$.

(a) Substitute each set of values into the expression, and factorise.

(i) $a = 1, b = -5, c = 0$ [2]

(ii) $a = 1, b = 7, c = 10$ [2]

(iii) $a = 2, b = 5, c = -3$ [2]

(b) When $a = 1$ and $c = -9$, determine the value of b so that the product of the factors of the expression is the difference of squares.

Show your working. [3]

(c) When $a = 1$ and $b = 8$, determine the value of c so that the expression factorises into a perfect square.

Show your working. [3]
