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Class	Register Number	Name
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BARTLEY SECONDARY SCHOOL

END-OF-YEAR EXAMINATION

MATHEMATICS

Sec 2 Normal (Academic)

Paper 1

5 October 2023

1 hour 30 minutes

Candidates answer on the Question Paper.

READ THESE INSTRUCTIONS FIRST

Write your class, register number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid / tape.

Answer **all** questions.

If working is needed for any question it must be shown with the answer.

Show all the working in the spaces below the questions.

Omission of essential working will result in loss of marks.

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

At the end of the examination, fasten all your work securely together.

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

The total number of marks for this paper is 50.

For Examiner's Use

This document consists of **13** printed pages and **3** blank pages.

Set by: Ms Agnes Ting

[Turn over

Mathematical Formulae*Mensuration*

Curved surface area of a cone = πrl

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

Volume of a cone = $\frac{1}{3}\pi r^2 h$

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

Answer **all** the questions.

1 Calculate $\frac{\sqrt{6.4 - 2.5}}{1.6^2}$.

Give your answer correct to 4 significant figures.

Answer [1]

2 Written as a product of its prime factors, $140 = 2^2 \times 5 \times 7$.

(a) Write 240 as a product of its prime factors.

Answer [1]

(b) Find the highest common factor of 240 and 140.

Answer [1]

(c) $240k$ is a perfect square.

Find the smallest integer value of k .

Answer $k =$ [1]

3 Expand and simplify

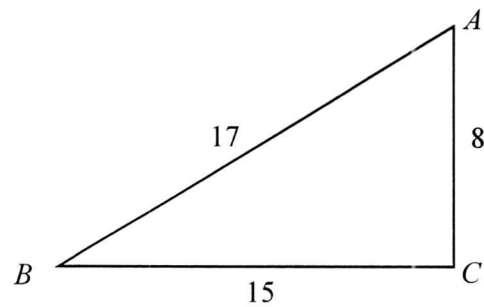
(a) $5x(x+3) - 2x$,

Answer [2]

(b) $(4y-3)(2y+5)$.

Answer [2]

4



ABC is a triangle in which $AB = 17$ cm, $BC = 15$ cm and $AC = 8$ cm.

Show that triangle ABC is a right-angled triangle.

Answer

.....
 [2]

5 Factorise completely

(a) $4mn + 2n$,

Answer [1]

(b) $x^2 + 6x + 9$,

Answer [1]

(c) $9x^2 - 4$.

Answer [2]

6 Simplify

(a) $\frac{n^2}{9m} \times \frac{6}{m^2n},$

Answer [1]

(b) $\frac{2p+q}{3q} \div \frac{8p+4q}{9p}.$

Answer [2]

7 Solve

(a) $7a - 9 = 5,$

Answer $a = \dots\dots\dots$ [2]

(b) $\frac{x}{4} + 2 = 5,$

Answer $x = \dots\dots\dots$ [2]

(c) $\frac{y-7}{2y} = \frac{3}{4}.$

Answer $y = \dots\dots\dots$ [3]

8 A map is drawn to a scale of 1 cm to 50 m.

(a) Express the map scale in the form of 1 : n .

Answer 1 : [1]

(b) The actual distance of a running track is 400 m.

Find the length of the track, in centimetres, on the map.

Answer cm [2]

(c) The area of a garden is 15 cm^2 on the map.

Calculate the actual area in the park, in square metres.

Answer m^2 [2]

- 9 6 students take 20 minutes to clean a classroom.

Find the time that 15 students will take to clean the classroom.

Answer minutes [2]

- 10 The speed limit on a certain road is 90 km/h.

(a) Write the speed limit in m/s.

Answer m/s [2]

(b) Jane drives along the road for a distance of 39 km.

Find the least time she will take if she does not exceed the speed limit.
Give your answer in minutes.

Answer minutes [2]

- 11 The marks of a Mathematics test for a Secondary Two class are shown in the stem-and-leaf diagram below.

Stem	Leaf										
0	5	7	9								
1	1	2	4	7	9	9	9				
2	1	2	5	5	6	6	7	7	8	9	
3	0	2	2	2	3	4	5	5	5	7	8
4	0	1	2	2	3	5	6	7			
5	0										

Key: 1 | 7 means 17 marks

- (a) State the highest mark scored.

Answer [1]

- (b) Find the number of students who scored at least 40 marks.

Answer [1]

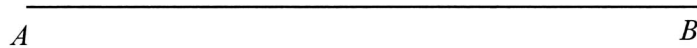
- (c) Find the percentage of students who scored less than 20 marks.

Answer% [2]

- 12 (a) Construct a triangle ABC such that $BC = 8$ cm and $AC = 6.8$ cm.

AB has been drawn for you.

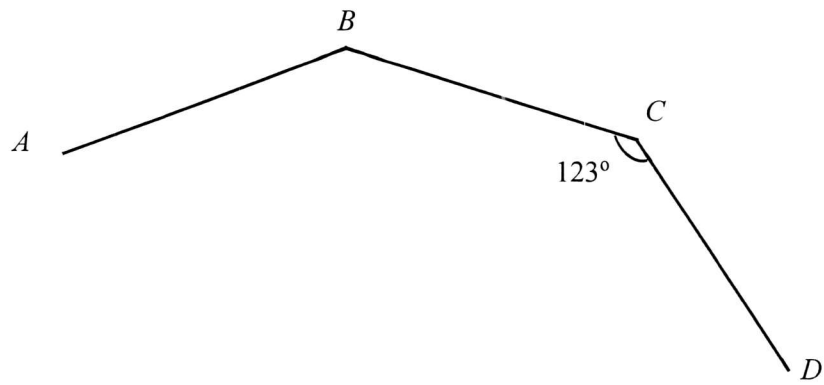
Answer



[2]

- (b) Measure angle ABC .

Answer ° [1]

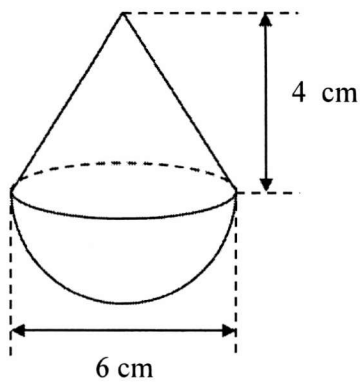


Ali claims that the diagram shows part of a regular polygon.
 Justify if Ali is correct.
 Show your working clearly.

Answer

.....
[2]

14



The diagram shows a solid wooden toy made up of a circular cone and a hemisphere. The toy is 6 cm wide and the height of the cone is 4 cm tall.

Calculate

(a) the volume of the wooden toy,

Answercm³ [3]

(b) the total surface area of the wooden toy.

Answercm² [3]

END OF PAPER

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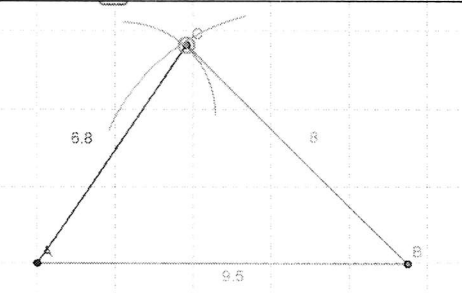
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2NA EOY PAPER 1 2023 MARKING SCHEME

Qn	Solution	Marks
1	0.7714	B1
2a	$2^4 \times 3 \times 5$	B1
2b	$140 = 2^2 \times 5 \times 7$ 20	B1
2c	15	B1
3a	$5x(x+3) - 2x = 5x^2 + 15x - 2x$ $= 5x^2 + 13x$	M1 – expand A1
3b	$(4y-3)(2y+5) = 8y^2 + 20y - 6y - 15$ $= 8y^2 + 14y - 15$	M1 – expand A1
4	$AB^2 = 17^2 = 289$ $AC^2 + BC^2 = 8^2 + 15^2$ $= 64 + 225$ $= 289$ $= AB^2$ By converse of Pythagoras theorem , triangle ABC is a right-angled triangle.	B1 – link to square of hypotenuse B1 – conclusion with theorem
5a	$4mn + 2n = 2n(2m + 1)$	B1
5b	$x^2 + 6x + 9 = (x + 3)^2$	B1
5c	$9x^2 - 4 = (3x)^2 - 2^2$ $= (3x + 2)(3x - 2)$	M1 A1
6a	$\frac{n^2}{9m} \times \frac{6}{m^2n} = \frac{2n}{3m^3}$	B1
6b	$\frac{2p+q}{3q} \div \frac{8p+4q}{9p} = \frac{2p+q}{3q} \times \frac{9p}{4(2p+q)}$ $= \frac{3p}{4q}$	M1- factorise A1
7a	$7a - 9 = 5$ $7a = 14$ $a = 2$	M1 A1
7b	$\frac{x}{4} + 2 = 5$ $\frac{x}{4} = 3$ $x = 12$	M1 – simplify A1

2NA EOY PAPER 1 2023 MARKING SCHEME

7c	$\frac{y-7}{2y} = \frac{3}{4}$ $4(y-7) = 6y$ $4y - 28 = 6y$ $-28 = 6y - 4y$ $2y = -28$ $y = -14$	M1 – cross multiply M1 – simplify to get 2y A1
8a	1 cm : 50 m 1 cm : 5000 cm (change to same units) 1 : 5000	B1
8b	1 cm : 50 m $400 / 50 = 8$ cm	M1 – division A1 – answer
8c	Area scale = $(1 \text{ cm} : 50 \text{ m})^2$ = $1 \text{ cm}^2 : 2500 \text{ m}^2$ $1 \text{ cm}^2 : 2500 \text{ m}^2 = 15 \text{ cm}^2 : 37500 \text{ m}^2$	M1 – area scale A1
9	$20 \times 6 / 15 = 8$ minutes	M1, A1
10a	$90 \text{ km} / \text{h} = \frac{90000 \text{ m}}{3600 \text{ s}}$ = $25 \text{ m} / \text{s}$	M1 – conversion A1
10b	Time taken = $39 / 90$ = $13/30$ hour = 26 min	M1 – for applying formula A1
11a	50	B1
11b	9	B1
11c	$\frac{10}{40} \times 100\% = 25\%$	M1 – 10 or 40 A1 – 25%
12a		B2 – All lengths are correct with 2 arcs at C B1 – either AC or BC is of the correct length with 2 arcs at C
12b	46°	B1
13a	Ext angle = $180^\circ - 123^\circ$ = 57° No of sides = $360 / 57$ = $6\frac{6}{19}$ Since number of sides is not a positive integer , Ali's claim is incorrect.	M1 A1

2NA EOY PAPER 1 2023 MARKING SCHEME

14a	Volume of toy = $\frac{1}{3}\pi(3)^2(4) + \frac{2}{3}\pi(3)^3$ = 94.2477961 = 94.2 cm ³	M1 – hemisphere M1 – cone A1
14b	Let slant height of water be x cm. $x^2 = 3^2 + 4^2$ $x = 5$ Surface area = $2\pi(3)^2 + \pi(3)(5)$ = 103.6725576 = 104 cm ²	M1 – slant height M1 – cone or hemisphere A1

Class	Register Number	Name
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BARTLEY SECONDARY SCHOOL

END-OF-YEAR EXAMINATION

MATHEMATICS

Sec 2 Normal (Academic)

Paper 2

10 October 2023

1 hour 30 minutes

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[Turn over

*Mathematical Formulae**Mensuration*

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

Volume of a cone = $\frac{1}{3}\pi r^2 h$

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

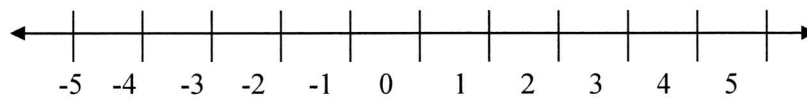
Answer **all** the questions.

- 1 (a) Solve the inequality $2x \geq -6$.

Answer [1]

- (b) Represent the solution on the number line given below.

Answer



[1]

- (c) Hence find the smallest integer satisfying $2x \geq -6$.

Answer $x =$ [1]

- 2 Carl, Davy and Eric share a box of strawberries in the ratio of 2 : 5 : 7.
Davy and Eric receive 36 strawberries.

Find the total number of strawberries in the box.

Answer [2]

- 3 m is directly proportional to the cube of r .
Given that $r = 5$ when $m = 2500$.

(a) Find an expression for m in terms r .

Answer [2]

(b) Using the equation in (a), find the value of

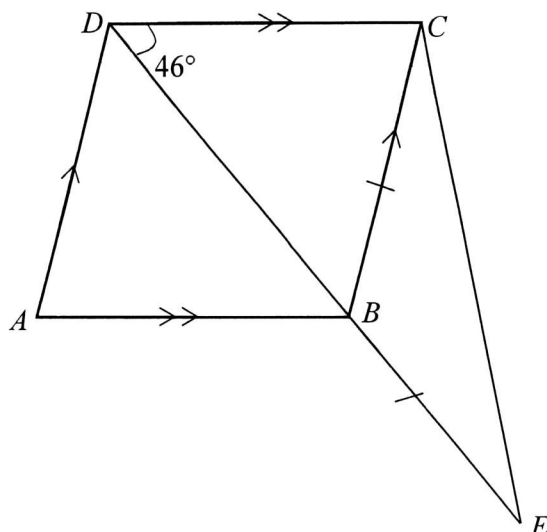
(i) m when $r = 3$,

Answer $m =$ [1]

(ii) r when $m = -160$.

Answer $r =$ [1]

4



The diagram shows a rhombus $ABCD$.
 DBE is a straight line, $BC = BE$ and angle $CDE = 46^\circ$.

Stating your reasons clearly, find

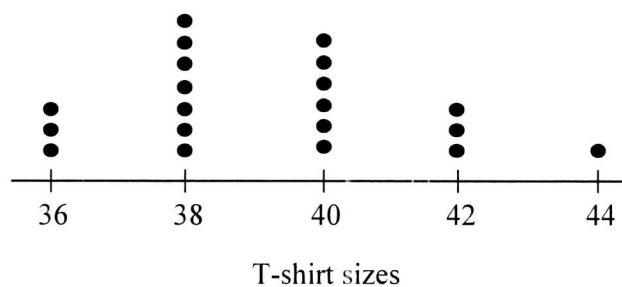
(a) angle BAD ,

Answer angle $BAD = \dots\dots\dots^\circ$ [2]

(b) angle BCE .

Answer angle $BCE = \dots\dots\dots^\circ$ [2]

5



The dot diagram shows the T-shirt sizes of 20 students.

(a) Find the mode.

Answer [1]

(b) Calculate the mean T-shirt size.

Answer [2]

(c) Find the median.

Answer [1]

- 6 Solve these simultaneous equations.

$$-5x + 4y = 13$$

$$3x + y = -1$$

Answer $x = \dots\dots\dots, y = \dots\dots\dots$ [3]

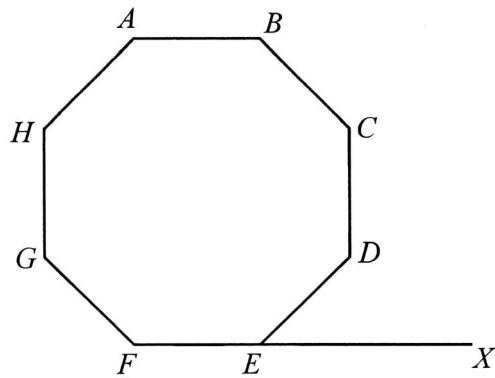
- 7 (a) Expand and simplify $(2x+5)^2 - 3(4x-1)$.

Answer [3]

- (b) Hence prove that $(2x+5)^2 - 3(4x-1)$ is an even number for all integer values of x .

Answer

.....
[2]



The polygon $ABCDEFGH$ is a regular octagon.

- (a) Calculate angle ABC .

Answer angle $ABC = \dots\dots\dots^\circ$ [2]

- (b) Side FE is extended to X .
Calculate angle DEX .

Answer angle $DEX = \dots\dots\dots^\circ$ [2]

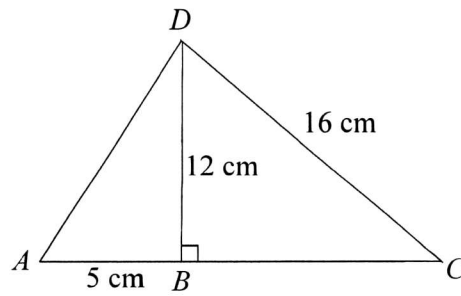
- 9 (a) Factorise $4x^2 + 4x - 3$.

Answer [1]

- (b) Hence simplify $\frac{4x-2}{4x^2+4x-3}$.

Answer [2]

10



ABC is a straight line.

$AB = 5$ cm, $DB = 12$ cm, $DC = 16$ cm and angle $CBD = 90^\circ$.

Find

(a) the length of AD ,

Answer $AD = \dots\dots\dots$ cm [2]

(b) the length of BC .

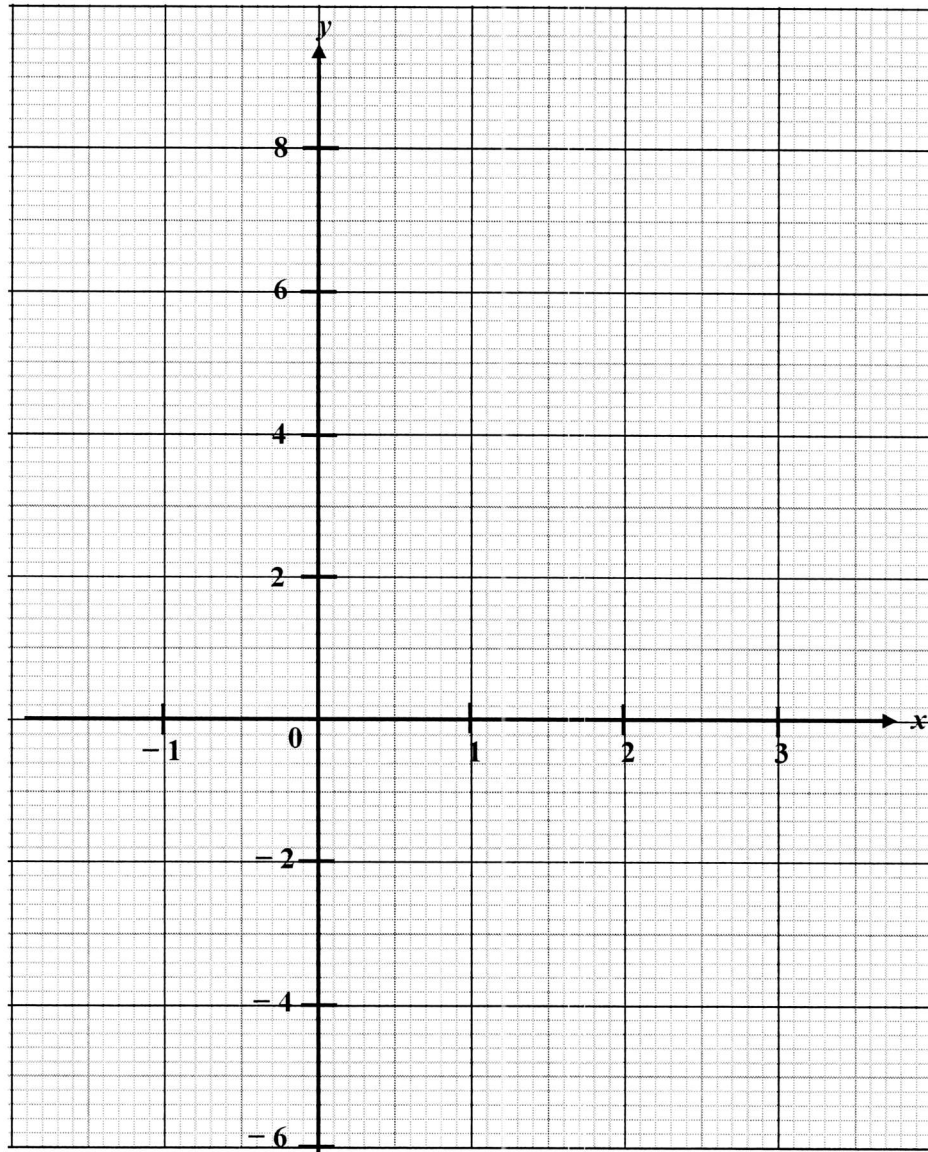
Answer $BC = \dots\dots\dots$ cm [2]

- 11 (a) Complete the table of values for $y = 5 - 2x$.

x	-1	1	2	3
y	7	3		-1

[1]

- (b) Draw the graph of $y = 5 - 2x$ for $-1 \leq x \leq 3$.



[2]

- (c) Use your graph to find the value of y when $x = 1.5$.

Answer $y = \dots\dots\dots$ [1]

- (d) Use your graph to find the value of x when $y = -0.6$.

Answer $x = \dots\dots\dots$ [1]

- (e) State the y - intercept of the graph.

Answer $\dots\dots\dots$ [1]

- (f) State the gradient of the line $y = 5 - 2x$.

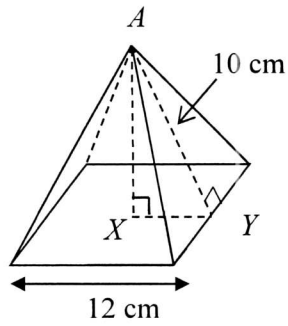
Answer $\dots\dots\dots$ [1]

- 12 The mean of seven numbers is 36.
Four of the numbers are 17, 20, 35 and 42.
The rest of the numbers are each equals to x .

Find the value of x .

Answer $x = \dots\dots\dots$ [2]

13



The diagram shows a right square pyramid with a base of side 12 cm.
The slant height of the pyramid, AY , is 10 cm.

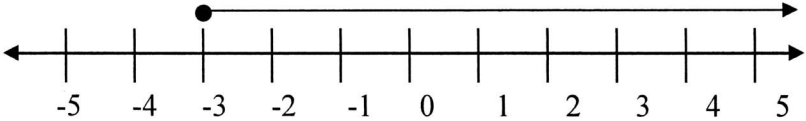
- (a) Calculate the volume of the pyramid.

Answercm³ [3]

- (b) Calculate the total surface area of the pyramid.

Answercm² [2]

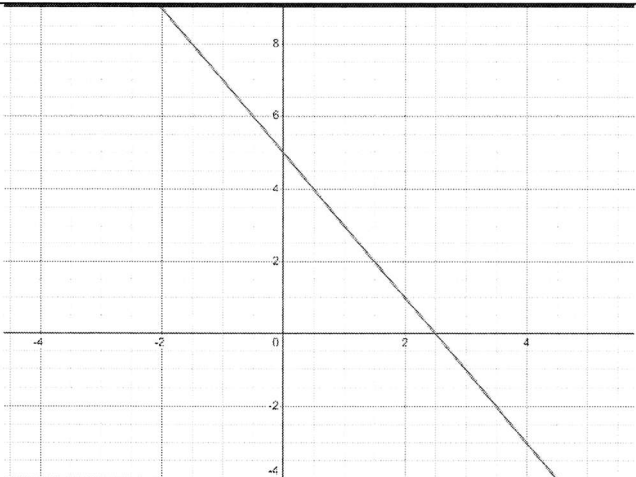
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Qn	Solution	Marks
1a	$2x \geq -6$ $x \geq -3$	B1
1b		B1
1c	-3	B1
2	$\frac{36}{12} \times 14 = 42$	M1, A1
3a	$m = kr^3$ When $r = 5$, $m = 2500$ $2500 = k(5)^3$ $2500 = 125k$ $k = 20$ $m = 20r^3$	M1 – find k A1
3b (i)	$m = 20(3)^3$ $m = 540$	B1
3b (ii)	$-160 = 20r^3$ $r^3 = -8$ $r = -2$	B1
4a	$\angle BCD = 180^\circ - 46^\circ - 46^\circ$ (base $\angle$ of isos Δ , $\angle$ s sum of Δ) $= 88^\circ$ $\angle BAD = \angle BCD$ (opp. $\angle$ s of rhombus) $= 88^\circ$ Or $\angle ABD = 46^\circ$ (alt. $\angle$ s) $\angle BAD = 180^\circ - 46^\circ - 46^\circ$ (base $\angle$ of isos Δ , $\angle$ s sum of Δ) $= 88^\circ$	M1 A1 – not awarded if reasons are not given M1 A1 – not awarded if reasons are not given
4b	$\angle DBC = 46^\circ$ (base $\angle$ of isos Δ) $\angle CBE = 180^\circ - 46^\circ$ (adj $\angle$ s on a straight line) $= 134^\circ$ $\angle BCE = (180^\circ - 134^\circ) \div 2$ (base $\angle$ of isos Δ , $\angle$ s sum of Δ) $= 23^\circ$	M1 A1 – not awarded if reasons are not given

2NA EOY PAPER 2 2023 MARKING SCHEME

5a	38	B1
5b	$\frac{36 \times 3 + 38 \times 7 + 40 \times 6 + 42 \times 3 + 44}{20} = \frac{784}{20}$ $= 39.2$	M1 A1
5c	$\frac{38 + 40}{2} = 39$	B1
6	$\begin{aligned} -5x + 4y &= 13 \\ 3x + y &= -1 \\ y &= -1 - 3x \text{ -----(3)} \\ -5x + 4(-1 - 3x) &= 13 \\ -5x - 4 - 12x &= 13 \\ -17x &= 17 \\ x &= -1 \\ y &= -1 - 3(-1) \\ &= 2 \end{aligned}$	M1 – substitution or elimination method A1 A1
7a	$\begin{aligned} (2x + 5)^2 - 3(4x - 1) \\ &= 4x^2 + 20x + 25 - 12x + 3 \\ &= 4x^2 + 8x + 28 \end{aligned}$	M2 – expansion of each bracket A1
7b	$4x^2 + 8x + 28 = 2(2x^2 + 4x + 14)$ Since 2 is a factor of $(2x + 5)^2 - 3(4x - 1)$, the expression is an even number for all values of x.	M1 – factorisation of 2 A1
8a	$\frac{(8 - 2) \times 180}{8} = \frac{1080}{8}$ $= 135$	M1 – sum of int $\angle$ A1
8b	$\angle DEF = 135^\circ$ $\angle DEX = 180^\circ - 135^\circ$ $= 45^\circ$	M1 A1
9a	$4x^2 + 4x - 3 = (2x - 1)(2x + 3)$	B1
9b	$\frac{4x - 2}{4x^2 + 4x - 3} = \frac{2(2x - 1)}{(2x - 1)(2x + 3)}$ $= \frac{2}{2x + 3}$	M1 – factorisation A1

2NA EOY PAPER 2 2023 MARKING SCHEME

10a	$AD^2 = 5^2 + 12^2$ $= 169$ $AD = \sqrt{169}$ $= 13$	M1 – for applying formula A1
10b	$16^2 = BC^2 + 12^2$ $256 = BC^2 + 144$ $BC^2 = 112$ $BC = \sqrt{112}$ $= 10.58300524$ $= 10.6$	M1 A1
11a	1	B1
11b		B2 – all points plotted correctly with straight line drawn B1 – 3 points plotted correctly with straight line drawn across the 3 points
11c	2	B1
11d	2.8	B1
11e	5	B1
11f	-2	B1
12	$36 \times 7 = 252$ $17 + 20 + 35 + 42 = 114$ $\frac{252 - 114}{4} = 34.5$	M1 A1
13a	$AX^2 = 10^2 - 6^2$ $= 64$ $AX = 8 \text{ cm}$ Volume of pyramid $= (1/3) (12 \times 12) (8)$ $= 384 \text{ cm}^3$	M1 – find AX M1 – apply formula A1
13b	Area of triangle $= (1/2) (12) (10) = 60 \text{ cm}^2$ Total area $= 60 \times 4 + 12 \times 12$ $= 384 \text{ cm}^2$	M1 A1

