



Cambridge IGCSE™ (9–1)

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MATHEMATICS

0980/31

Paper 3 (Core)

October/November 2020

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

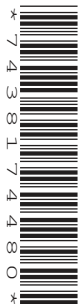
INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π , use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 104.
- The number of marks for each question or part question is shown in brackets [].

This document has **20** pages. Blank pages are indicated.



1 Sean is the manager of a museum.

- (a) He buys a Chinese pot costing 1200 yuan.
The exchange rate is $\$1 = 6.4$ yuan.

Work out the cost of this pot in dollars.

\$ [1]

- (b) Sean records the maximum and minimum temperatures, in $^{\circ}\text{C}$, at the museum.
Some of the results for one week are shown in the table.

| Day | Mon | Tue | Wed | Thu | Fri | Sat | Sun |
|--|-----|-----|-----|-----|-----|-----|-----|
| Maximum temperature ($^{\circ}\text{C}$) | 8 | 12 | 15 | 14 | 11 | 7 | 4 |
| Minimum temperature ($^{\circ}\text{C}$) | -5 | -2 | -4 | -1 | 3 | | |

- (i) Find the difference between the maximum temperature and the minimum temperature on Wednesday.

..... $^{\circ}\text{C}$ [1]

- (ii) The minimum temperature on Saturday was 2°C higher than the minimum temperature on Monday.

Find the minimum temperature on Saturday.

..... $^{\circ}\text{C}$ [1]

- (iii) In this week the range of temperatures was 23°C .

Find the minimum temperature on Sunday.

..... $^{\circ}\text{C}$ [1]

- (c) These are the opening times for the museum.

| | |
|---------------------|----------------|
| Monday to Friday | 09 00 to 17 00 |
| Saturday and Sunday | 10 00 to 16 00 |

During opening hours the museum has 4 security guards working.
Each guard works a maximum of 30 hours each week.

Work out the smallest number of guards needed each week.

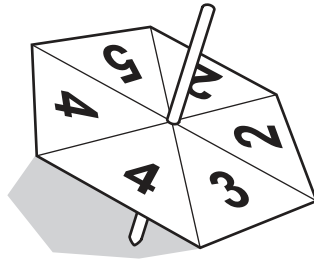
..... [4]

- (d) The entry price to the museum is \$18.
This price is increased by 28%.

Find the increased entry price.

\$ [2]

- 2 (a) Jian has a fair spinner in the shape of a regular hexagon. The spinner is numbered 2, 2, 3, 4, 4, 5.



Jian spins the spinner.

Find the probability that the spinner lands on

- (i) an even number,

..... [1]

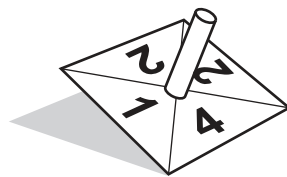
- (ii) a number less than 6,

..... [1]

- (iii) the number 1.

..... [1]

- (b) Mei has two fair square spinners, A and B. Spinner A is numbered 1, 2, 2, 4 and spinner B is numbered 3, 3, 4, 5.



Spinner A



Spinner B

She spins both spinners and adds the two numbers.

- (i) Complete the table to show all the possible outcomes.

| | | | | |
|-------|---|---|---|---|
| A \ B | 3 | 3 | 4 | 5 |
| 1 | 4 | 4 | | |
| 2 | 5 | 5 | 6 | 7 |
| 2 | 5 | 5 | 6 | 7 |
| 4 | 7 | 7 | | |

[2]

(ii) Use the table to write down the probability that the total is

(a) 5,

..... [1]

(b) more than 5.

..... [1]

(c) Ning has a spinner numbered 1 to 6.
She spins it 50 times and her results are shown in the table.

| Number on spinner | Frequency |
|-------------------|-----------|
| 1 | 15 |
| 2 | 12 |
| 3 | 9 |
| 4 | 5 |
| 5 | 2 |
| 6 | 7 |

(i) Write down the mode.

..... [1]

(ii) Find the median.

..... [1]

(iii) Work out the mean.

..... [3]

3 (a)

8 15 18 33 39 41 51 57 60 81

From this list, write down

(i) a factor of 54,

..... [1]

(ii) a multiple of 19,

..... [1]

(iii) a prime number.

..... [1]

(b) Write down the reciprocal of 64.

..... [1]

(c) (i) Write 4.81×10^{-3} as an ordinary number.

..... [1]

(ii) Write 75 000 in standard form.

..... [1]

(iii) Calculate $\frac{6.3 \times 10^2}{7 \times 10^{-3}}$.

Write your answer in standard form.

..... [2]

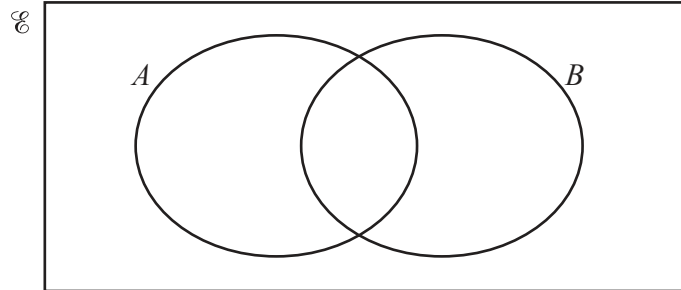
(d) (i)

$$\mathcal{C} = \{2, 4, 8, 16, 32, 64\}$$

$$A = \{\text{square numbers}\}$$

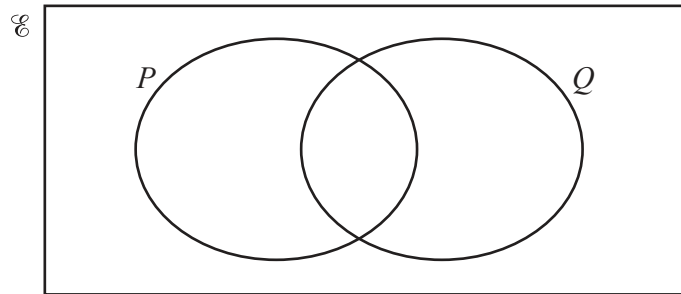
$$B = \{\text{cube numbers}\}$$

Use this information to complete the Venn diagram.



[2]

(ii) On this Venn diagram, shade the region $P \cup Q$.



[1]

4 (a) Simplify.

$$6a - 3b + 2a - 4b$$

..... [2]

(b) Expand.

$$5(x - 3)$$

..... [1]

(c) Solve these equations.

(i) $\frac{x}{3} = 18$

$x =$ [1]

(ii) $5x + 18 = 8$

$x =$ [2]

(iii) $12x - 3 = 4x + 21$

$x =$ [2]

(d) $6^{10} \times 6^x = 6^2$

Find the value of x .

$x =$ [1]

- (e) The Fraser family and the Singh family go to the cinema.
The Fraser family buys 6 adult tickets and 2 child tickets for \$124.
The Singh family buys 3 adult tickets and 5 child tickets for \$100.

Find the price of an adult ticket and the price of a child ticket.

Adult ticket \$

Child ticket \$ [5]

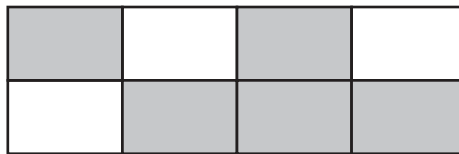
5 (a) Write one hundred and twenty thousand and twenty in figures.

..... [1]

(b) Find the value of $\sqrt{3481}$.

..... [1]

(c)



(i) Write down the fraction of the rectangle that is shaded.

..... [1]

(ii) Find the percentage of the rectangle that is **not** shaded.

.....% [1]

(d) Write these numbers in order, starting with the smallest.

$$27\% \quad \frac{5}{17} \quad 0.268 \quad \frac{7}{29}$$

..... < < < [2]
smallest

(e) Write 0.3728 correct to 1 decimal place.

..... [1]

(f) Write down the value of 19^0 .

..... [1]

(g) The height, h metres, of a tower is 128 m, correct to the nearest metre.

Complete the statement about the value of h .

..... $\leq h <$ [2]

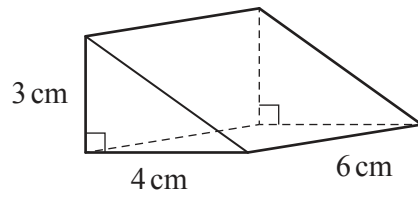
(h) Find the highest common factor (HCF) of 126 and 180.

..... [2]

(i) Write down an irrational number with a value between 6 and 7.

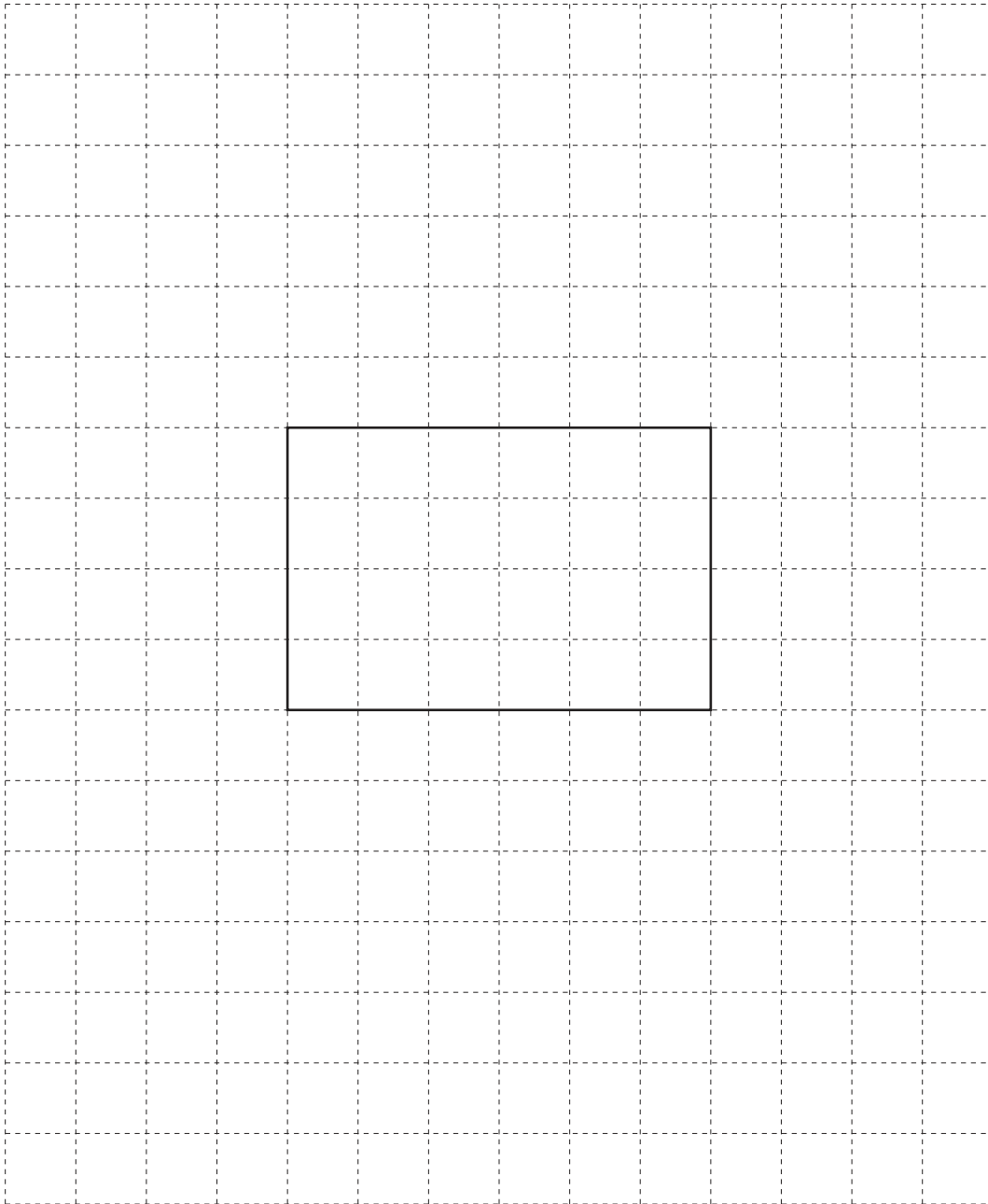
..... [1]

6

NOT TO
SCALE

The diagram shows a right-angled triangular prism.

- (a) On the 1 cm^2 grid, complete the net of the prism.
One face has been drawn for you.



[3]

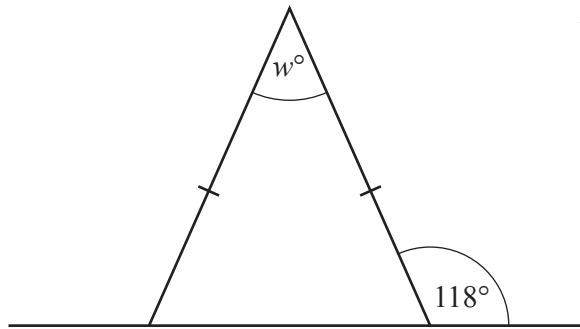
(b) Work out the surface area of the prism.

..... cm^2 [3]

(c) Work out the volume of the prism.

..... cm^3 [2]

7 (a)



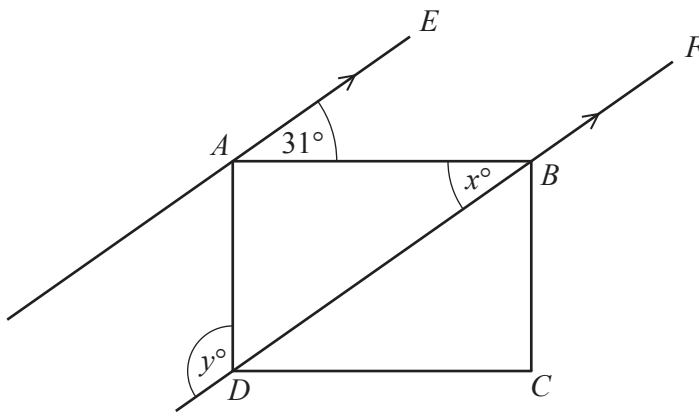
NOT TO SCALE

The diagram shows an isosceles triangle and a straight line.

Work out the value of w .

$w = \dots\dots\dots$ [2]

(b)



NOT TO SCALE

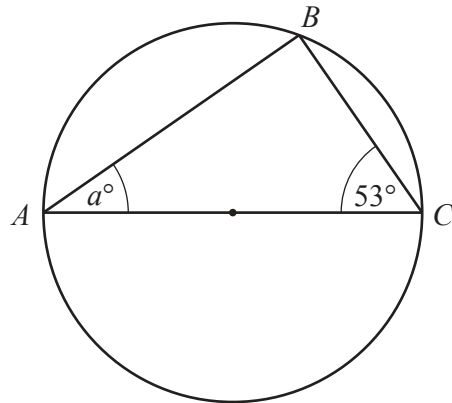
$ABCD$ is a rectangle.
 AE is parallel to DBF .

Find the value of x and the value of y .

$x = \dots\dots\dots$

$y = \dots\dots\dots$ [2]

(c)

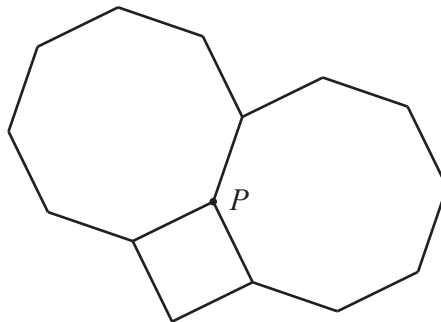
NOT TO
SCALE

A , B and C are points on a circle.
 AC is a diameter of the circle.

Find the value of a .

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

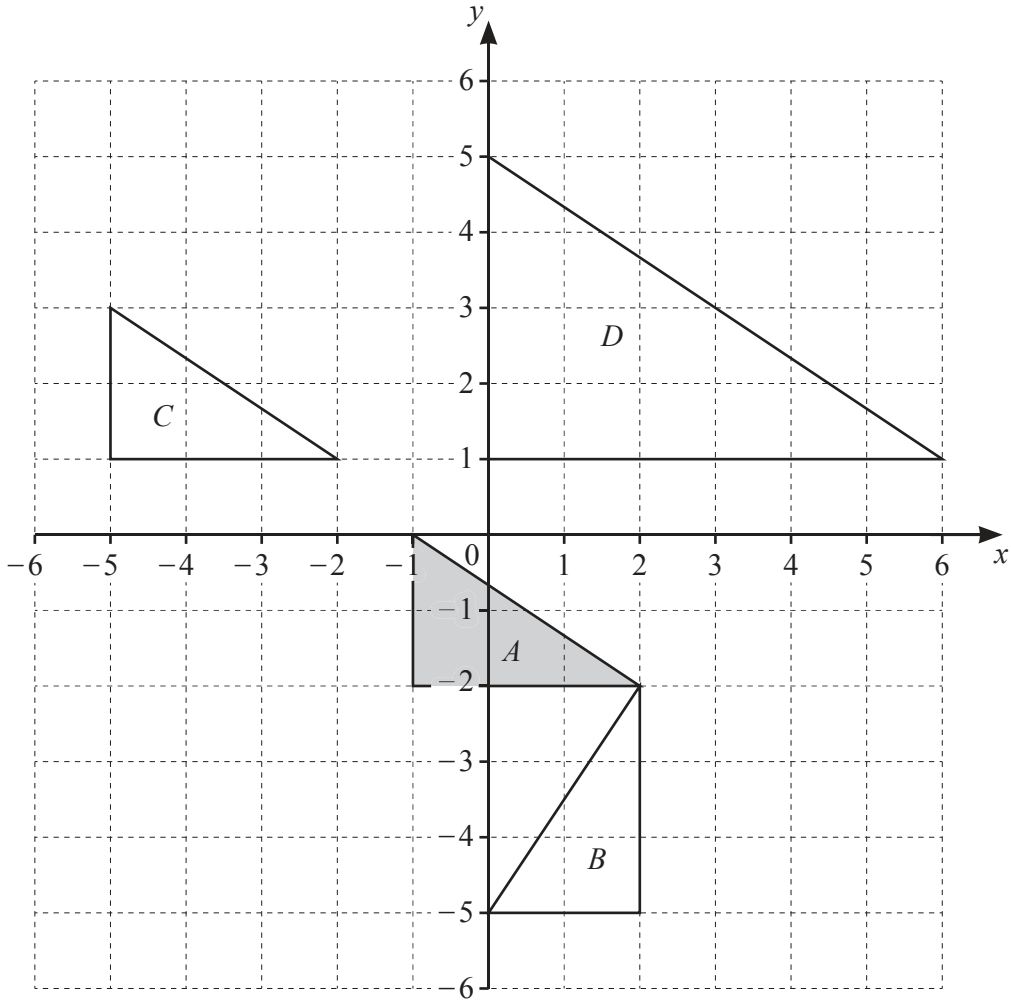
(d)

NOT TO
SCALE

Two regular octagons and a square meet at point P .

Show, by calculation, that the three interior angles at P add up to 360° .

[3]



(a) Describe fully the **single** transformation that maps

(i) triangle *A* onto triangle *B*,

.....
 [3]

(ii) triangle *A* onto triangle *C*,

.....
 [2]

(iii) triangle *A* onto triangle *D*.

.....
 [3]

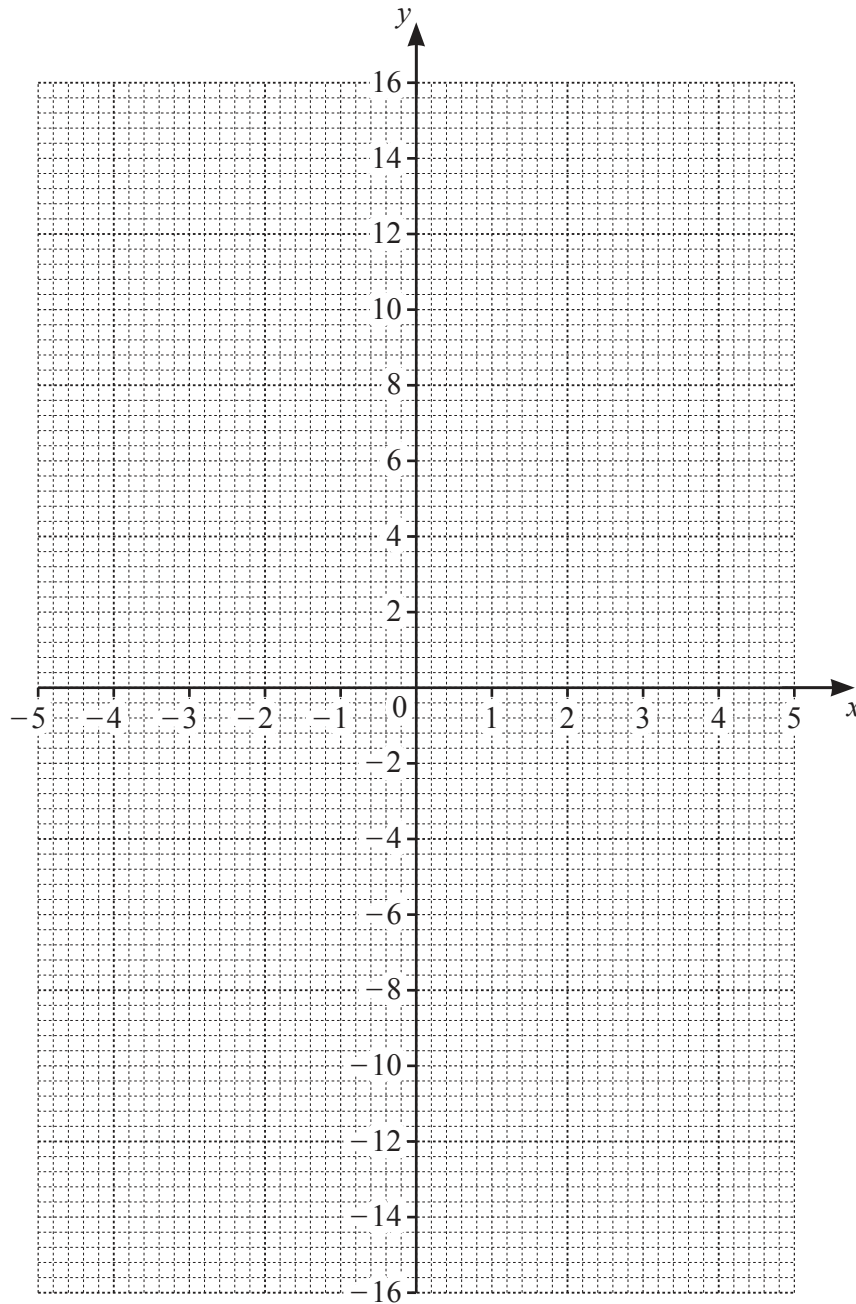
(b) On the grid, draw the image of triangle *A* after a reflection in the line $x = -2$. [2]

9 (a) Complete the table of values for $y = \frac{15}{x}$.

| | | | | | | | | | |
|-----|----|----|----|-----|--|----|---|---|---|
| x | -5 | -3 | -2 | -1 | | 1 | 2 | 3 | 5 |
| y | | | | -15 | | 15 | | | |

[3]

(b) On the grid, draw the graph of $y = \frac{15}{x}$ for $-5 \leq x \leq -1$ and $1 \leq x \leq 5$.



[4]

(c) On the grid, draw the line $y = 6$.

[1]

(d) Use your graph to solve $\frac{15}{x} = 6$.

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

10 (a) These are the first four terms of a sequence.

8 15 22 29

(i) Write down the next term.

..... [1]

(ii) Write down the term to term rule for continuing this sequence.

..... [1]

(iii) Find an expression for the n th term.

..... [2]

(b) Find the next term in each of these sequences.

(i) 18, 21, 26, 33, 42, ...

..... [1]

(ii) 18, 20, 24, 32, 48, ...

..... [1]

(c) Find the first three terms of the sequence with n th term $n^2 + 5n$.

..... , , [2]

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