

GRAYS TUITION CENTRE – Online Tutoring

WEEK: 5

Week Beginning: (18/01/2021)

Subject: MATHS

Year: 8

Lesson Objective:

- Be able to use map scales
- Be able to find the n th term of arithmetic sequences
- Be able to use the n th term to find numbers in the sequence

Class Worksheets

- Pages 214 to 223 in Learning Pack (see below)
- Exam style – n th term questions

Homework

- Additional n th term questions from the Learning Pack (see below)

Additional Notes

- All lesson worksheets and **homework for next week (due Week 6)** worksheets can be found below
- Previous week homework will be marked in lesson

- 7 The total weight of 8 tiles is 1720 g. How much do 17 tiles weigh?
- 8 A machine can fill 3000 bottles in 15 minutes. How many bottles will it fill in 2 minutes?
- 9 If 4 grapefruit can be bought for £2.96, how many can be bought for £8.14?

10



Carl and Simone jet ski 25 km in 30 minutes. How long will they take to jet ski 40 km at the same speed?

- 11 £15 can be exchanged for 18 euros. How many euros can be exchanged for £37.50?
- 12 A car travels 280 km on 35 litres of petrol. How much petrol is needed for a journey of 440 km?
- 13 Usually it takes 10 hours for 4 men to build a wall. How many men are needed to build a wall twice as big in 10 hours?

14

christmas	decorations
baubles	£10.20 for 12
candles	£18.60 for 20
angels	£8 for 5

The prices of some Christmas decorations are shown opposite. Jim needs to buy 8 baubles and 12 candles. He also wants to buy as many angels as possible with the rest of his money. He has £20 to spend. How many angels can he buy with his left-over money?

Map scales

On a map of scale 1:2 000 000, Swansea and Cardiff appear 3 cm apart.

What is the actual distance between the towns?

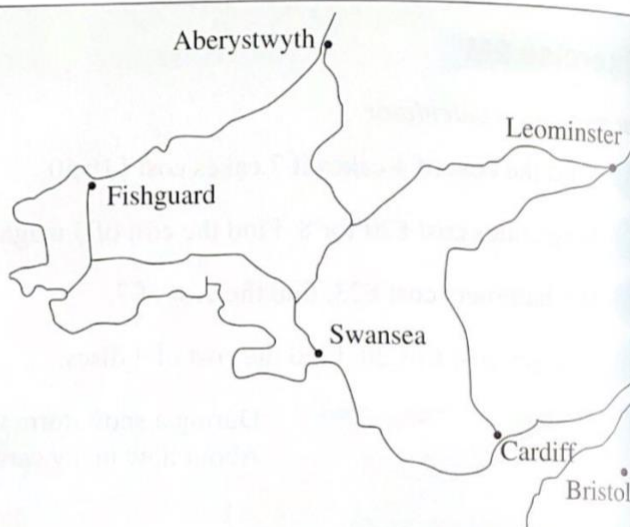
1 cm on map = 2 000 000 cm on land.

3 cm on map = $3 \times 2\,000\,000$ cm on land.



6 000 000 cm = 60 000 m

= 60 km

Swansea is 60 km from Cardiff.



Exercise 2E

- 1 On a map whose scale is 1:1000, the distance between two houses is 3 cm. Find the actual distance between the two houses, giving your answer in metres.
 - 2 The distance on a map between two points is 8 cm. Find the actual distance in metres between the two points, given that the scale of the map is 1:100.
 - 3 The scale of a certain map is 1:10 000. What is the actual distance in metres between two churches which are 4 cm apart on the map?
 - 4 On a map whose scale is 1:100 000, the distance between two villages is 7 cm. What is the actual distance in kilometres between the two villages?
 - 5 The distance on a map between two towns is 9 cm. Find the actual distance in kilometres between the two towns, given that the scale of the map is 1:1 000 000.
 - 6 Find the actual distance in metres between two towers which are 5 cm apart on a map whose scale is 1:10 000.
 - 7 A river is 5 cm long on a map whose scale is 1:20 000. Find the actual length of the river.
 - 8 The distance on a map between two buildings in Miami is 3 cm. The scale of the map is 1:50000. What is the actual distance between the two buildings in kilometres?
- 
- 9 Two places are separated by a distance of 20 cm on a map having a scale of 1:6000. How far apart in reality are the two places?
 - 10 The scale of a map is 1:200 000. What is the actual distance between two villages given that they are 8.5 cm apart on the map?
 - 11 If two towns are 5.4 cm apart on a map and the scale of the map is 1:3 000 000, what is the actual distance between the two towns?
 - 12 Andrew finds that the distance between two cities on a map whose scale is 1:5 000 000 is 12 cm. What is the actual distance in kilometres between the two cities?
 - 13 If the distance between two places on a map is 10 cm, find the actual distance in kilometres between the two places, given that the scale of the map is 1:10 000.
- 
- 14 Sandra has two maps. There are train stations in Manley and Cowton. Map A has a scale of 1:20 000 and shows that Sandra is 17.5 cm from Manley. Map B has a scale of 1:50 000 and shows that Sandra is 6 cm from Cowton. Which train station should Sandra head for if she wants to walk the least distance? *Explain your answer.*

Exercise 1M

Copy and complete these mapping diagrams.

a)

Term number (n)	Term
1	6
2	12
3	18
4	24
\vdots	\vdots
12	<input type="text"/>
\vdots	\vdots
n	<input type="text"/>

(b)

Term number (n)	Term
1	8
2	16
3	24
4	32
\vdots	\vdots
8	<input type="text"/>
\vdots	\vdots
n	<input type="text"/>

(c)

Term number (n)	Term
1	10
2	20
3	30
\vdots	\vdots
15	<input type="text"/>
\vdots	\vdots
n	<input type="text"/>

Copy and complete these mapping diagrams. Notice that an extra column has been written.

(a)

Term number (n)	$4n$	Term
1	4	5
2	8	9
3	12	13
4	16	17
\vdots	\vdots	\vdots
20	<input type="text"/>	<input type="text"/>
\vdots	\vdots	\vdots
n	$4n$	<input type="text"/>

(b)

Term number (n)	$5n$	Term
1	5	4
2	10	9
3	15	14
4	20	19
\vdots	\vdots	\vdots
12	<input type="text"/>	<input type="text"/>
\vdots	\vdots	\vdots
n	<input type="text"/>	<input type="text"/>

(c)

Term number (n)	$2n$	Term
1	2	3
2	4	5
3	6	7
4	8	9
\vdots	\vdots	\vdots
10	<input type="text"/>	<input type="text"/>
\vdots	\vdots	\vdots
n	<input type="text"/>	<input type="text"/>

(d)

Term number (n)	$5n$	Term
1	5	7
2	10	12
3	15	17
4	20	22
\vdots	\vdots	\vdots
20	<input type="text"/>	<input type="text"/>
\vdots	\vdots	\vdots
n	<input type="text"/>	<input type="text"/>

- 3 Write down each sequence and select the correct expression for the n th term from the list given.

(a) 3, 6, 9, 12, ...

(b) 5, 10, 15, 20, ...

(c) $1^2, 2^2, 3^2, 4^2, \dots$

(d) 7, 14, 21, 28, ...

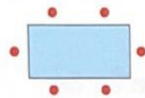
(e) 2, 3, 4, 5, 6, ...

(f) 5, 8, 11, 14, 17, ...

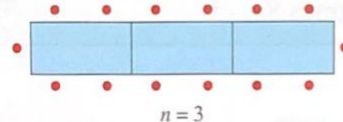
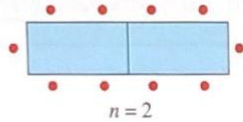
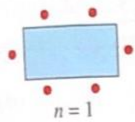
(g) 1, 3, 5, 7, 9, ...

$3n$ $n+1$
 $7n$ $2n-1$
 n^2 $5n$ $3n+2$

- 4 This table can seat 6 people.

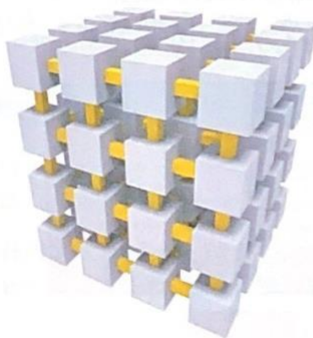


The diagrams below show how many people can be seated when tables are joined together.



- (a) Draw the diagram for 4 tables.
- (b) Write down how many people sit at 1 table, 2 tables, 3 tables and 4 tables.
- (c) How many people would sit at 5 tables?
- (d) Copy and fill in the empty box:
 'The number of people sitting at n tables is $4n + \square$ '
- (e) Discuss with your teacher *why* the rule in part (d) works.

5



A mesh is made from cubes as shown. Several different sizes are made. The number of cubes used each time is shown below:

1, 8, 27, 64, 125, ...

Which of the rules below works for this sequence?

$n+7$

n^2+4

n^3

n^2-1

What have you learnt about sequences?

1. i. Find the next term
- ii. Describe the term to term rule
- iii. State whether the sequence is geometric, linear, quadratic or Fibonacci type
 - a. 2, 6, 10, 14, 18, ...
 - b. 2, 4, 8, 14, 22, ...
 - c. 1, 2, 4, 8, 16, ...
 - d. 20, 17, 14, 11, 8, ...

2. What is meant by the n th term or T_n

3. Find the value of the term

a. $3n + 5$ Term 7 = _____

c. $4n + 6$ Term 20 = _____

e. $n^2 + 4$ Term 6 = _____

g. $n(n - 1)$ Term 7 = _____

b. $2n - 3$ Term 2 = _____

d. $3n - 5$ Term 1 = _____

f. $2n^2$ Term 3 = _____

h. $20 - 5n$ Term 6 = _____

4. Laura found the value of the 5th term for the sequences. Which answers are correct? Correct her wrong answers.

a. $2n + 3$ Term 5 = 28

c. $30 - 2n$ Term 5 = 5

e. $n^2 - 3$ Term 5 = 22

g. $n(n + 1)$ Term 5 = 30

b. $3n - 1$ Term 5 = 14

d. $20 - 3n$ Term 5 = 5

f. $2n^2$ Term 5 = 100

h. $(4n)^2$ Term 5 = 200

5. Write the first five terms for each sequence given by the n th term

a. $T_n = 3n + 2$

b. $T_n = 4n - 1$

c. $T_n = 5n - 3$

d. $T_n = 3n - 5$

e. $T_n = (n - 1)(n + 1)$

f. $T_n = 3n^2$

6. Find the n th term (T_n)

a. 3, 5, 7, 9, 11, ...

b. 2, 6, 10, 14, 18, ...

c. 2, 5, 8, 11, 14, ...

d. 7, 11, 15, 19, 23, ...

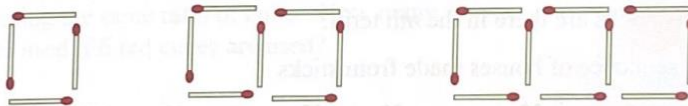
e. 18, 16, 14, 12, 10, ...

f. 30, 27, 24, 21, 18, ...

- 3 In the sequence 6, 10, 14, 18, ... the difference between terms is 4. Copy and complete the table and write an expression for the n th term of the sequence.

n		term
1	<input type="checkbox"/>	6
2	<input type="checkbox"/>	10
3	<input type="checkbox"/>	14
4	<input type="checkbox"/>	18

- 4 Look at the sequence 5, 8, 11, 14, ... Write down the difference between terms. Make a table like the one in question 3 and use it to find an expression for the n th term.
- 5 Write down each sequence in a table and then find the n th term.
- (a) 8, 10, 12, 14, 16, ...
- (b) 3, 7, 11, 15, ...
- (c) 8, 13, 18, 23, ...
- 6 Make a table for each sequence and write the n th term.
- (a) 11, 19, 27, 35, ...
- (b) $2\frac{1}{2}$, $4\frac{1}{2}$, $6\frac{1}{2}$, $8\frac{1}{2}$, ...
- (c) -7, -4, -1, 2, 5, ...
- 7 Here is a sequence of shapes made from sticks



Shape number: $n = 1$ $n = 2$ $n = 3$
 Number of sticks: 4 7 10

The number of sticks makes the sequence 4, 7, 10, 13, ...

Make a table for the sequence and find the n th term.

Exercise 2E

In questions 1 to 6 you are given a sequence of shapes made from sticks or dots. If you need to, make a table to help you find the n th term of the sequence.

- 1 Here is a sequence of triangles made from dots. Draw the next diagram in the sequence. How many dots are there in the n th term?



Shape number: $n = 1$ $n = 2$ $n = 3$
 Number of sticks: 3 6 9

1. Here are the first five terms in a number sequence.

7 10 13 16 19

(a) Find the 10th term in this number sequence.

.....
(2)

(b) Write an expression, in terms of n , for the n th term of this number sequence.

.....
(2)

2. A number sequence has n th term $6n + 3$

(a) Write down the first four terms of this sequence.

1st term, 2nd term, 3rd term, 4th term
(3)

(b) Sara says that 1008 is a term in this sequence.
Explain why she is wrong.

.....
.....
.....
(1)

Homework

3. A sequence of numbers is shown below.

1 5 9 13 17

(a) Find an expression for the n th term of the sequence.

.....
(2)

(b) Explain why 95 will not be a term in this sequence.

.....
.....
(2)

4. The n th term of a number sequence is given by $5n + 2$

(a) Work out the first three terms of the number sequence.

1st term, 2nd term, 3rd term
(2)

Here are the first five terms of another number sequence.

5 11 17 23 29

(b) Find, in terms of n , an expression for the n th term of this sequence.

.....
(2)

Finding the n th term of a linear sequence

Exercise A

Find expressions for the n th terms of each of the following sequences:

- | | | | |
|-------------------------|-------|-------------------------|-------|
| 1. 3, 5, 7, 9, ... | _____ | 2. 9, 11, 13, 15, ... | _____ |
| 3. 7, 11, 15, 19, ... | _____ | 4. 4, 7, 10, 13, ... | _____ |
| 5. 5, 7, 9, 11, ... | _____ | 6. 5, 9, 13, 17, ... | _____ |
| 7. 7, 12, 17, 22, ... | _____ | 8. 2, 5, 8, 11, ... | _____ |
| 9. 1, 5, 9, 13, ... | _____ | 10. 1, 3, 5, 7, ... | _____ |
| 11. 7, 5, 3, 1, ... | _____ | 12. 16, 13, 10, 7, ... | _____ |
| 13. 3, 6, 9, 12, ... | _____ | 14. 7, 14, 21, 28, ... | _____ |
| 15. 3, 8, 13, 18, ... | _____ | 16. 12, 10, 8, 6, ... | _____ |
| 17. 1, 8, 15, 22, ... | _____ | 18. 10, 20, 30, 40, ... | _____ |
| 19. 29, 23, 17, 11, ... | _____ | 20. 0, -4, -8, -12, ... | _____ |

Write down the first three terms of sequences whose n th term is:

- | | | | |
|---------------|-------|-------|-------|
| 21. $3n + 8$ | _____ | _____ | _____ |
| 22. $6n - 5$ | _____ | _____ | _____ |
| 23. $9n$ | _____ | _____ | _____ |
| 24. $-7n - 1$ | _____ | _____ | _____ |

5. A sequence of numbers is shown.

2 9 16 23 30

(a) Find an expression for the n th term of the sequence.

.....
(2)

(b) Find the 100th term in the sequence.

.....
(2)