SCORE

Algebra
With Classified
answer book

8

Eng. Magda El-Labban   📞 01007044107

20- Sequences

1. Here are the first 5 terms of an arithmetic sequence.

   $$6, \quad 11, \quad 16, \quad 21, \quad 26$$

   Find an expression, in terms of n, for the nth term of the sequence.

   ....

2. Here are the first five terms of a number sequence.

   $$3 \quad 8 \quad 13 \quad 18 \quad 23$$

   (a) Write down the next **two** terms of the sequence.

   ...., ...

   (b) Explain how you found your answer.

   ....

3. Here are the first five terms of a number sequence.

   $$126 \quad 122 \quad 118 \quad 114 \quad 110$$

   (a) Write down the next two terms of the number sequence.

   .... , ...

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

   ....

4. Here are the first five terms of a number sequence.

$$3 \quad 7 \quad 11 \quad 15 \quad 19$$

    (a) Work out the 8th term of the number sequence.

                    ....

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

                    ....

5. The nth term of sequence S is $2n + 5$
   The nth term of sequence T is $3n - 6$

  (a) Show that 91 is a term in sequence S.

  (b) Show that 91 is **not** a term in sequence T.

  (c) Find the value of the term that is in both sequences
     and is in the same position in each sequence.

                    ....

6. Here are the first five terms of an arithmetic sequence.

$$-1 \quad 3 \quad 7 \quad 11 \quad 15$$

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

   ....

   In another arithmetic sequence the nth term is $8n - 16$

   John says that there is a number that is in both sequences.

   (b) Explain why John is wrong.

   ....

   ....

7. The first four terms of an arithmetic sequence are

$$21 \quad 17 \quad 13 \quad 9$$

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

   ....

   (b) The nth term of a sequence is $2n^2$

   (i) Find the 4th term of the sequence.

   ....

   (ii) Is the number 400 a term of the sequence?

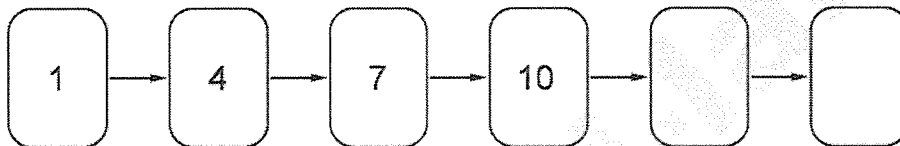   ....

   Give reasons for your answer.

8. (a) The rule for this sequence is to **add the same number each time.**

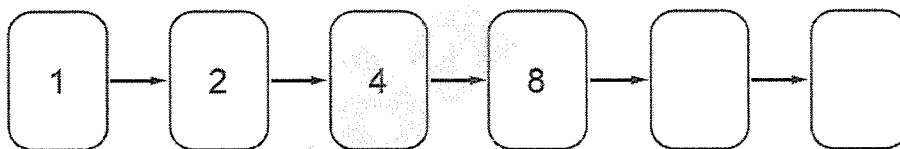Use this rule to write the missing numbers in the sequence.

| 3 | | | | 19 |
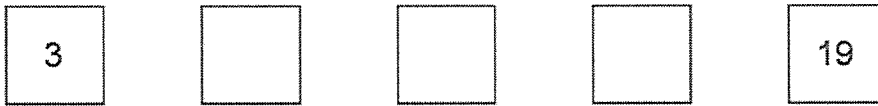
(b) Fill in the missing numbers in these number chains.

Rule: **Add 3** each time.

1 → 4 → 7 → 10 → ☐ → ☐
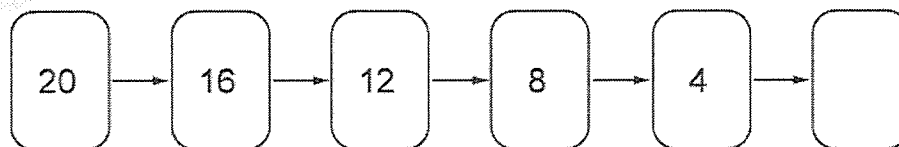
Rule: **Multiply by 2** each time.

1 → 2 → 4 → 8 → ☐ → ☐

(c) Here is a different number chain.

What could the rule be?

Fill in the rule. Then use the rule to write in the missing number.

Rule: .... each time.

20 → 16 → 12 → 8 → 4 → ☐

9. A sequence of numbers starts at the number 12

The numbers **increase by 4** each time.

| 12 | 16 | 20 | 24 | 28 |

The sequence keeps going forever.

(a) Will the number **39** be in the sequence?

Tick (✓) Yes or No.

☐ Yes   ☐ No

Explain your answer.

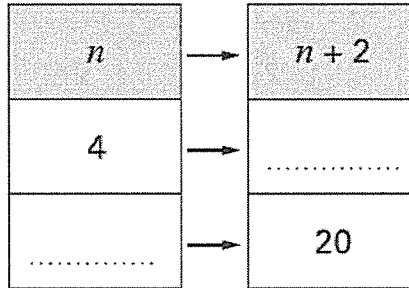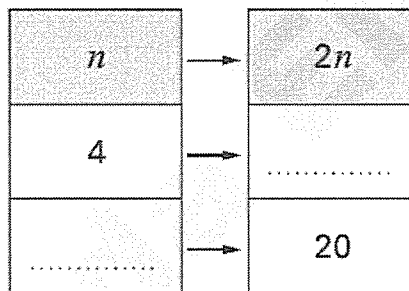(b) Will the number **100** be in the sequence?

Tick (✓) Yes or No.

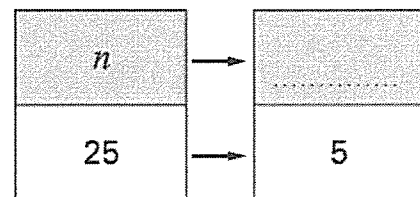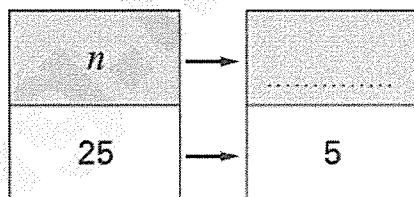☐ Yes   ☐ No

Explain your answer.

10. (a)   A function maps the number n to the number $n + 2$

Complete the missing values.

n	→	$n + 2$
4	→	....
....	→	20

(b)   A different function maps the number n to the number $2n$

Complete the missing values.

n	→	$2n$
4	→	....
....	→	20

(c)   Many different functions can map the number 25 to the number 5

Complete the tables by writing two **different** functions.

n	→	....
25	→	5

n	→	....
25	→	5

11. The rule to get the next number in this number chain is

> **double, then subtract 5**

Fill in the **two** missing numbers in the number chain.

| | | 35 | | 65 | | 125 | | 245 | | | |

$$\boxed{} \rightarrow \boxed{35} \rightarrow \boxed{65} \rightarrow \boxed{125} \rightarrow \boxed{245} \rightarrow \boxed{} \rightarrow$$
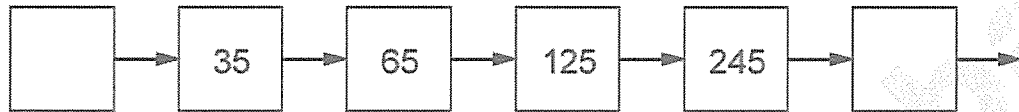
12. A different sequence has this expression for the nth term:

$$\frac{1}{(n+1)^2}$$

Work out the fi rst four terms in the sequence.

_____   _____   _____   _____

13. Different sequences of numbers start like this:

> 2   4   8 ...

The nth term of one of the sequences is $n(n-1)+2$

What is the **4th term** of this sequence?

14. The first three terms of a sequence are shown in the box.

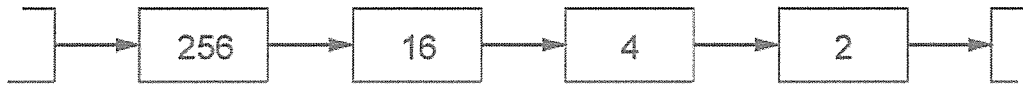$$5, \quad 16, \quad 27, \quad ...$$

Look at each expression below.

Write 'No' if it could not be the nth term expression for this sequence.

Write 'Yes' if it could be the nth term expression for this sequence and then work out the **4th** term.

The first one is done for you.

Expression	Could it be the nth term expression?	If 'Yes', work out the 4th term
Sn	No	✕
$n + 11$		
$11n-6$		
$n^2(6-n)$		

15. Look at this number chain.

| | → | 256 | → | 16 | → | 4 | → | 2 | → | |

Each number is the **square root** of the previous number.

(a) What number comes **after 2** in the chain?

Give your answer as a **decimal**.

(b) What number comes **before 256** in the chain?
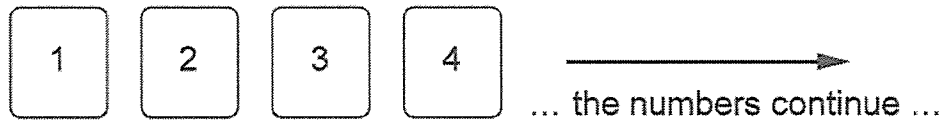
(c) The chain goes on forever.

Will the number 0 ever be in the chain? Tick (✓) Yes or No.

☐ Yes   ☐ No

Explain your answer.

16. A teacher has number cards, numbered from 1 to *n*

| 1 | 2 | 3 | 4 |

... the numbers continue ...

The teacher says:

> I have *n* number cards, numbered from **1 to *n***
>
> $\frac{1}{5}$ of the cards show **square numbers**.

What could the value of *n* be?

There are three possible answers. Give them all.

n = _____

or   *n* = _____

or   *n* = _____

17. Here are the nth term rules of three sequences.

Sequence A $\qquad$ $7n$

Sequence B $\qquad$ $5n - 1$

Sequence C $\qquad$ $20 - 3n$

Match each of these numbers to the sequence it is a term in.

24 $\qquad$ Sequence A

11 $\qquad$ Sequence B

35 $\qquad$ Sequence C

18. The nth term of a sequence is $n2 + a$.

The 6th term of the sequence is 29

Find the sum of the first 4 terms.

....

19. Here are the *n*th term expressions for three different sequences.

$$2^{(n-1)}$$

Sequence A

$$\frac{n^2 - n + 2}{2}$$

Sequence B

$$\frac{n(n^2 - 3n + 8)}{6}$$

Sequence C

The first three terms of each sequence are 1, 2 and 4

What is the **4th term** of each sequence?

You **must** show your working.

Sequence A _____

Sequence B _____

Sequence C _____

20. (a)   **Draw lines** to match each nth term rule to its number sequence.

nth term	Number sequence

$4n$

$4, \ 7, \ 12, \ 19, \ ...$

$(n + 1)^2$

$4, \ 8, \ 12, \ 16, \ ...$

$n^2 + 3$

$4, \ 9, \ 16, \ 25, \ ...$

$n(n + 3)$

$4, \ 10, \ 18, \ 28, \ ...$

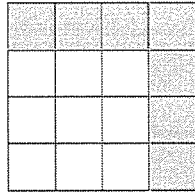(b) Write the first four terms of the number sequence using the nth term rule below.

$n^3 + 3$
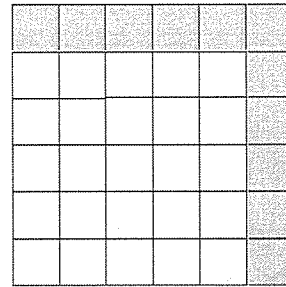
_____, _____, _____, _____

21. This series of patterns is made with grey and white tiles.

Look at the first three patterns in the series.
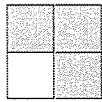
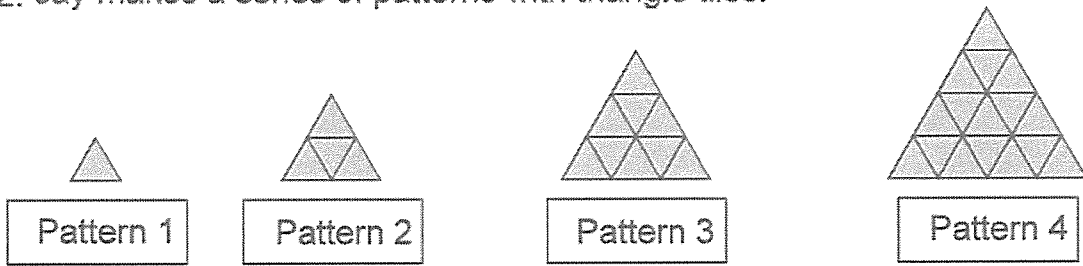First pattern   Second pattern   Third pattern

(a) Write a **number** to complete this sentence.

Each new pattern in the series has . . . . more grey tiles than the pattern before.

(b) How many grey tiles are there in the **fifth** pattern?

. . . .

22. Jay makes a series of patterns with triangle tiles.

| Pattern 1 | Pattern 2 | Pattern 3 | Pattern 4 |

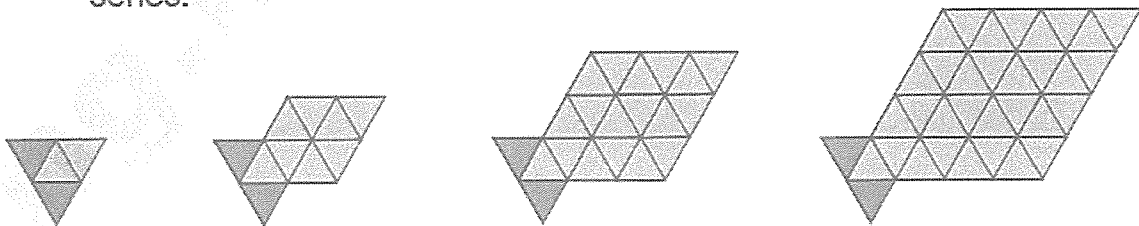Pattern n in Jay's series has n^2 tiles.

(a) Jasmine copies Jay's series.

Then she adds 2 tiles to each pattern in the series.
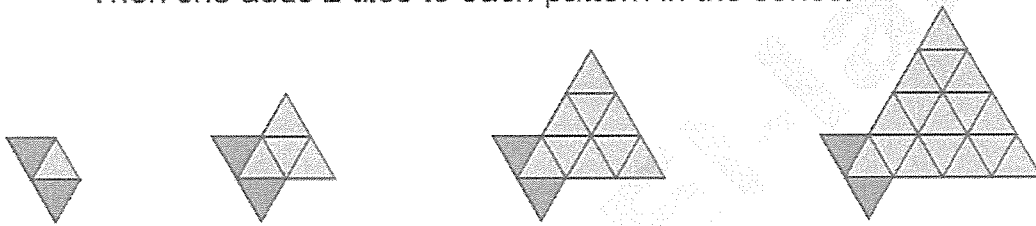
Write an expression for the number of tiles in Pattern n in Jasmine's series.
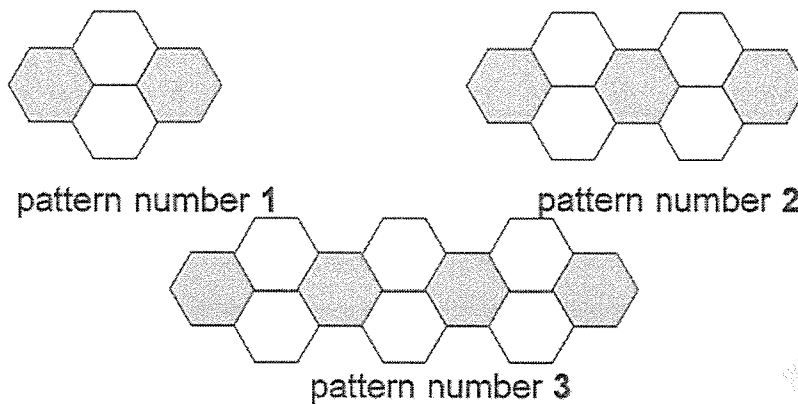
(b) Tom puts Jay's and Jasmine's patterns together to make a new series.

Write an expression for the number of tiles in Pattern n in Tom's series.

. . . .

23. (a) Look at this sequence of patterns made with hexagons.

pattern number **1**   pattern number **2**

pattern number **3**

To find the number of hexagons in pattern number *n* you can use these rules:.

Number of **grey** hexagons   = $n + 1$

Number of **white** hexagons   = $2n$

Altogether, what is the total number of hexagons in **pattern number 20**?

_____

(b) The numbers in this sequence go up in equal steps.

   Write the missing numbers.
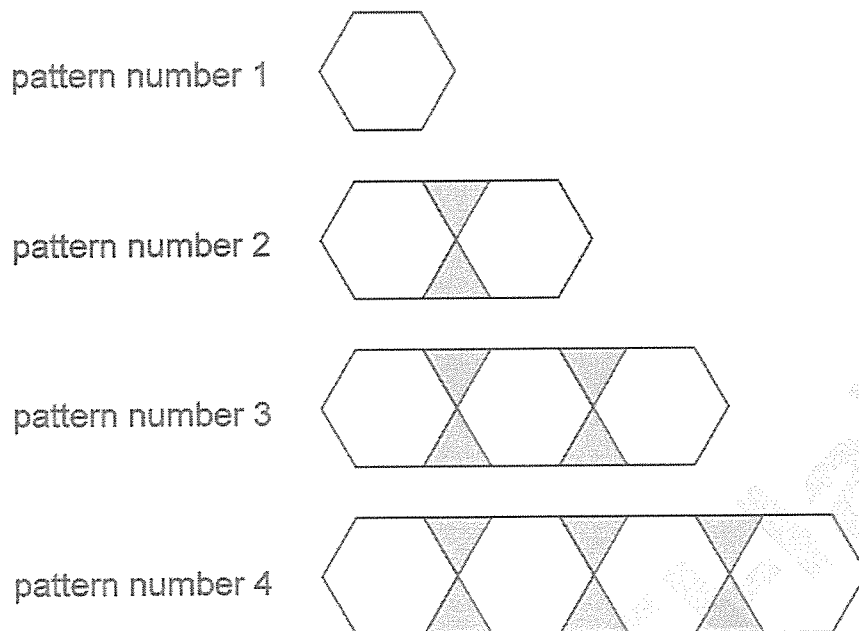
   40, ☐ , ☐ , 100, ☐ , ...

(c) Each number in this sequence is half of the number before.

   Write the missing numbers.

   ☐ , 20, 10, 5, ☐ , ☐ , ...

24. Here is a sequence of patterns made from hexagons and triangles.

pattern number 1

pattern number 2

pattern number 3

pattern number 4

The sequence of patterns continues.

(a) In **pattern number 90**, how many hexagons and how many triangles will there be?

.... hexagons   .... triangles

(b) In which pattern will there be **100 triangles**?

pattern number ....

25. A sequence of numbers starts at the number 5

The numbers **double** each time.

| 5 | 10 | 20 | 40 | ... |

The sequence keeps going forever.

(a) Will the number **145** be in the sequence?

Tick (✓) Yes or No.

☐ Yes   ☐ No

Explain your answer.

(b) Will the number **-100** be in the sequence?
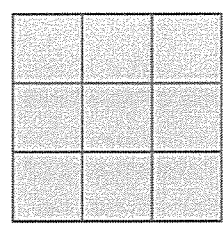
Tick (✓) Yes or No.

☐ Yes   ☐ No

Explain your answer.

26. Mary and David have square tiles like this:

They arrange the tiles to make bigger squares.

Example: **9 tiles** can make a **3 by 3 square**.

(a) Mary arranges **25 tiles** to make one square.

Complete the sentence below.

25 tiles can make a .... by .... square.

(b) David arranges **25 tiles** to make **two squares**.

His two squares are not the same size.

What are the sizes of David's squares?

First square: .... by ....

Second square: .... by ....

27. (a) The nth term of a sequence is $3n + 4$

What is the **8th** term of this sequence?

(b) The nth term of a different sequence is $\dfrac{n-2}{n^2}$

Write the first **three** terms of this sequence.