# TOOLKIT FOR TEACHERS

# INFANT TWO

# PRIMARY MATHEMATICS

# Contents

# INTRODUCTION

The Primary mathematics toolkits are intended to assist teachers with instructional planning using the Belize National Curriculum for Primary Schools. They include advisory content examples and teaching points for every lower division mathematics learning outcome. These are presented in the order they should be taught. Material from the toolkits can be copied directly into instructional plans. Teachers can edit the material in any way and can add their own examples and teaching points.

The advice in the toolkits is based on the belief that knowledge in mathematics is best developed as students solve problems, explore and record results, analyze observations, make and test generalizations and reach new conclusions. The suggestions aim to provide practical, adaptable and real life content with a focus on helping students explore mathematics for themselves.

The toolkits present activities that should challenge students to complete active learning tasks, both independently and collaboratively. Instruction in new concepts proceeds from simple ideas that are familiar to the students to more complex, abstract ideas. Whenever possible, these concepts are initially presented with concrete and picture-based examples. They encourage the use of manipulatives as tools for allowing students to explore mathematical ideas for themselves. Furthermore, the content examples and teaching points encourage teachers to link mathematical concepts to the students' experiences outside the classroom so that they see mathematics as useful and worthwhile. Instruction should also promote a positive attitude, encourage students to take intellectual risks, involve frequent word-based problem solving and allow students to learn from each other.

Long term success in mathematics depends on the ability to mentally perform routine calculations with fluency and accuracy. These skills, and the accompanying understanding of number concepts and quantities, can be developed through the frequent playing of games that require mental calculations. Fluency and accuracy in the performance of mental calculations should be consolidated through short, individualized, repetition and practice activities such as drills conducted on a daily basis. Whole class chanting and choral response of memorized procedures and tables is less effective and its use should be minimized.

# Advisory Content Examples and Teaching Points

## INFANT TWO

**NUMBERS A**

### 1.12 *Count up to 100 using a number chart.*

| Numbers 1 - 100 | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |

Number Charts are a useful tool for teaching young students counting and math because they display a specific range of numbers in big clear writing.

The number chart is used as scaffolding, that is, it is used to help students learn. With sufficient practice, they should increasingly be able to count without the use of the number chart.

Counting does not always start at 1. They should practice counting from different numbers, for example, the teacher can say, "start at 44".

The focus should be on ensuring each individual student can count, rather than on whole-class chanting or choral response.

### 1.13 *Count groups of up to one hundred objects using the five counting principles of stable order, one-to-one correspondence, cardinality, abstraction and order irrelevance.*

There are five distinct counting principles.

| | |
|---|---|
| Stable Order | When counting, the order of the number names always stays the same. |
| One-to-one correspondence | Each object is counted once and only once. |
| Cardinality | The last number counted represents the total number of items in a group. |
| Abstraction | How we count stays the same no matter what is being counted. |
| Order Irrelevance | The order in which items are counted does not change the quantity. |

The counting principles were introduced in infant one. The main purpose of this learning outcome is for students to apply the principles to larger groups of objects.

**NUMBERS A**

## 1.14 *Match number names and numeric symbols for numbers from 0 to 100 both orally and in writing.*

The focus of this learning outcome is on matching the number names said orally with the numerals. Some students may be able to read and write the words (with or without the hyphen) but this is not essential at this stage in infant two.

Review this skill every day using flashcards and 5 minute games.

Draw a line from the number word to its number match on the other side.

| Fifty-one | 36 |
| Ninety-three | 24 |
| Eighteen | 51 |
| Thirty-six | 93 |
| Twenty-four | 18 |

## 1.15 *Apply the concept of zero to real-life situations.*

Zero is used with countable nouns but not uncountable ones. It would not be usual to say "there is zero water in the glass." Instead, we would say "There is no water in the glass."

Example:

There are four marbles in the red jar but there is zero in the blue jar.

Other examples:

"The number of elephants in the Belize Zoo is zero."

"The student did not know the answers so she got zero on the test."

"The red team scored three goals. The blue team got zero."

"The chance of seeing cows falling from the sky is zero."

## 1.16 *Identify the position of an item in a group using ordinal numbers from first to one hundredth.*

Ordinal numbers tell the position of the object.

Identify the position of each runner by the colour of their shirt.

Provide objects to count such as marbles, beads and buttons, for example, line up five objects and then ask questions, such as: Which object is second in line? Which one is fifth?

Use real life examples such as finishing position in a race. It is important to include higher numbers.
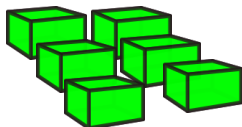
"The cyclist was fifty-eighth in the race."

"She caught the ball at the twentieth attempt."

"The seventy-fifth customer to enter the store won a prize."
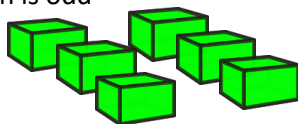
**NUMBERS A**

### 1.17 *Distinguish between odd and even numbers.*

An even number of objects can be divided equally into two groups or into groups of 2. If a group cannot be divided equally, then it is an odd number.

Six is even.                    Seven is odd

After dividing seven into 2 equal groups, there is one left over – "the odd one out".

Students can discover for themselves which numbers are odd or even by dividing a number of objects into groups of two.

They can then apply the rule below to larger numbers:

*To tell whether a number is **even** or **odd**, look at the number in the ones place.*

*An **even** number ends in **0, 2, 4, 6, or 8**.*

*An **odd** number ends in **1, 3, 5, 7, or 9***

**NUMBERS B**

## 1.18 *Compose 2-digit numbers from groups of tens and ones.*

Composing is building a number from its parts, such as from its tens and ones.

Tens    Ones

52
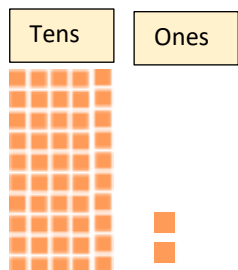
Composing numbers reinforces students' concepts of place value.

Students need to develop automaticity with composing numbers because this will help build success with addition, subtraction, multiplication, and division.

Visualization is an important part of developing flexibility with number structure. For this reason, students will benefit from frequently working with spatial patterns, dot cards, ten frames and abacuses.

## 1.19 Decompose 2-digit numbers into groups of tens and ones.

Decomposing is breaking a number down into its parts, for example by tens and ones.

52          5 tens and 2 ones
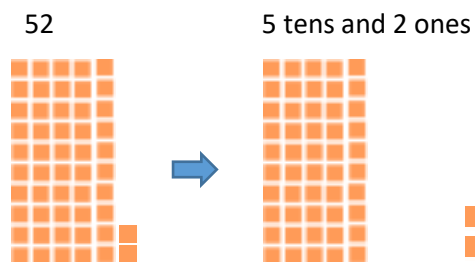
The practice of decomposing numbers allows young students to understand the patterns and relationships between digits within a larger number and between numbers within an equation.

Students can initially learn about breaking numbers into smaller components by using counters and interlocking blocks such as lego.

Students should get a lot of practice in decomposing numbers, both using real objects and orally.

The ability to rapidly decompose numbers develops flexibility in understanding and calculating with numbers. For example, later students will learn that 52+14 can be calculated as 50+2+10+4.

## 1.20 *Sequence a set of numbers between 0 and 100, in ascending and descending order, using a number line.*

The teacher can call out numbers in a jumbled order for the students to circle on the number line, for example:

59, 53, 43, 63, 48

40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

The students should then write the numbers from smallest to largest (ascending) and from largest to smallest (descending).

A number line teaches the concept that numbers occur in a fixed *pattern*, not randomly. This means that the order of numbers never changes. A six always follows a five, ten always goes after nine, and so on.

If students find the words ascending and descending confusing, use "going up" and "going down" instead. Link ascending and descending to real life situations such as ascending and descending in an aeroplane.
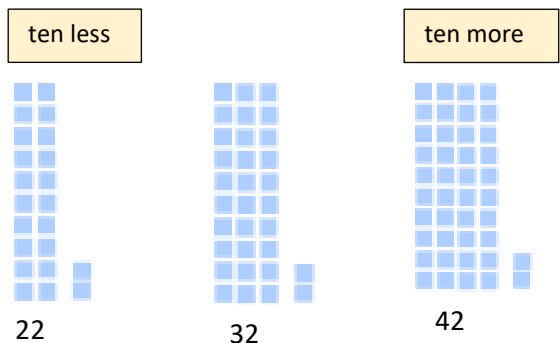
**NUMBERS B**

## 1.21 *Identify the number that is ten more or ten less than a given number using a place value chart.*

Following on from the previous learning outcome the concept of ten more and ten less can be introduced using a number line.
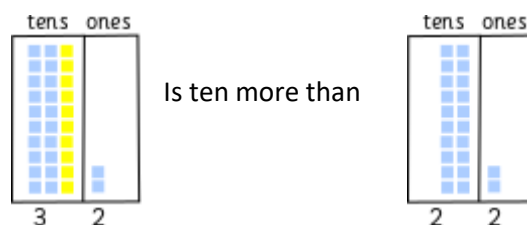
22 is ten less than 32    42 is ten more than 32
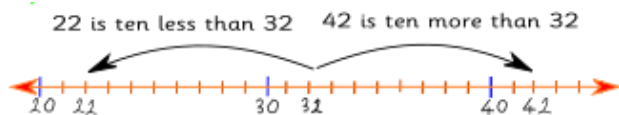


Students' attention should be drawn to the number in the tens position.

Blocks can also be used.

ten less                    ten more



22            32            42

The position of each digit in a number tells its value, or **place value.**

After students have used real objects, then a place value chart can be used with blocks.



tens ones                Is ten more than            tens ones

3    2                                        2    2

The next step is to use the place value chart without manipulatives or blocks.

tens   ones



3
4        2
2
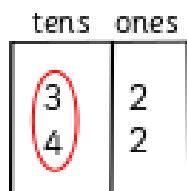
You can tell 42 is ten more than 32 by looking at the number in the tens column.

## 1.22 *Estimate to the closest benchmark number, for example, 5, 10, 25 or 50 before counting a set of objects to find the exact amount.*

Understanding benchmark numbers is a beginning step towards estimation, number sense and place value development.

Mike made a guess that there are about 10 marbles in the jar just by looking.  Then he counted them to discover there were actually 8.  This means Mike made a good guess.
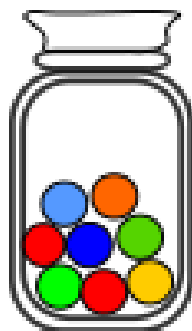


As students make estimations, they will develop an increasingly strong sense of quantity.  They should work with both small and relatively large quantities of objects.

Estimate to the nearest 25, how many bottle tops there are.
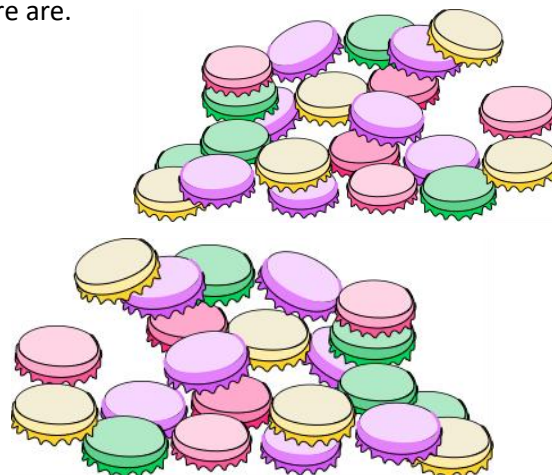
**1.23 Sequence a set of non-consecutive numbers between 0 and 100 using a place value chart.**

| | |
|---|---|
| This learning outcome is similar to 1.19 but in this case, a place value chart rather than a number line is used. | When sequencing numbers, students should look at the value in the tens column first.  If these are the same, they should look at the number in the ones column. |

**1.24 *Compare numbers from 0 to 100 using the less than, greater than and equals signs.***

When given two numbers represented by objects, students use comparison language and symbols to determine which is greater and which is smaller. Students can compare numbers using concrete manipulatives and pictures.

73     >     65          10     <     21

When a student compares numbers, they are deciding if a number is greater than, less than, or equal to another number.

Generally, students who are first learning to compare numbers need to start with hands-on comparing. Any small toy can be used as a manipulative. Make two groups of the toys. Have your students count each group and write the numbers down. Then have them decide which group is bigger and write the correct symbol between the numbers.

**GEOMETRY A**
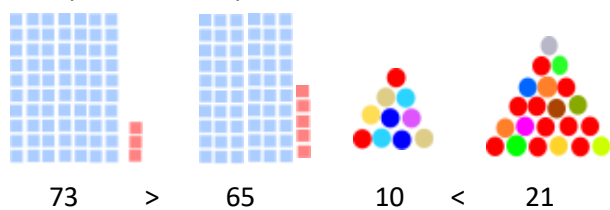
## 6.8 *Draw lines, rays and angles.*

This learning outcome builds on knowledge introduced in infant one with the additional requirement that the items must be accurately drawn. This implies that students should add arrows and dots as per the diagrams below.
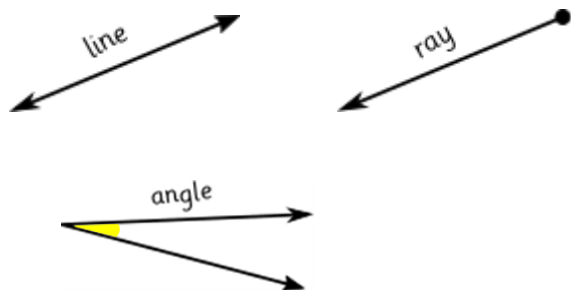


Accuracy in drawing is essential. Teachers should monitor that the ruler is held with a firm grip and that lines are straight.

Using the words "ray", "line" and "angle" as students draw, familiarizes students with the proper terminology.

Students can incorporate the rays, lines and angles into drawings of real life situations. A real life example of a ray is rays of the sun. The ray of light starts at the sun and could go on forever.

A line drawn to show a ball leaving a bat would be a ray. The bat is the starting point.

Students can demonstrate angles in pictures of tables, chairs, slides and other objects.

This learning outcome focuses on drawing. It is not necessary to measure the lines, angles or rays.

## 6.9 *Differentiate between horizontal, vertical and diagonal lines.*

The lines used in the previous learning outcome could be drawn in any direction. Learning outcome 7.9 introduces names for special types of line.

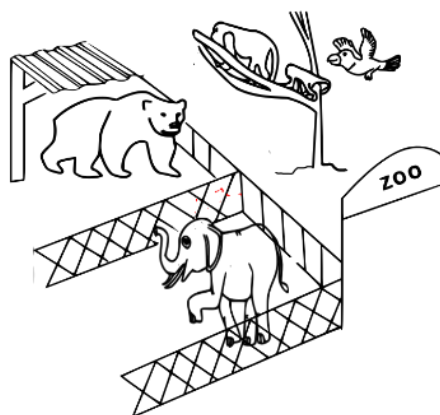A horizontal line goes from side to side but not up and down.

A vertical line goes up and down but not side to side.

A diagonal line is slanted. It goes both up and down and side to side.

Use real objects and pictures to show vertical, horizontal and diagonal lines in real life.

**GEOMETRY A**

**6.10** *Identify the similarities and differences between triangles, squares, rectangles and circles.*

Students will learn the attributes of shapes if they carry out their own investigations, for example by completing the following chart.

| | Name | How Many Sides | How Many Corners |
|---|---|---|---|
|  | Triangle | | |
|  | Rectangle | | |
|  | Circle | | |
|  | Square | | |

Students should appreciate that a square is a special type of rectangle that has 4 equal sides. In other rectangles, only opposite sides are of equal length.

**6.11** *Create by drawing or modelling 2-D shapes with a specified number of sides.*

Examples of 2-D shapes.
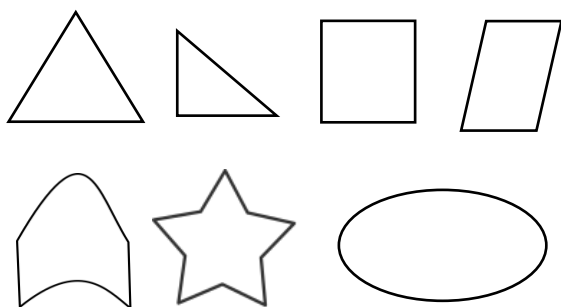


Students need to recognize that there are both straight sides and curved sides. Students should be encouraged to develop strategies for accurate counting of sides, such as by marking each side as it has been counted. Students also need to understand that not all same-sided shapes look the same, such as with irregular 2D shapes.
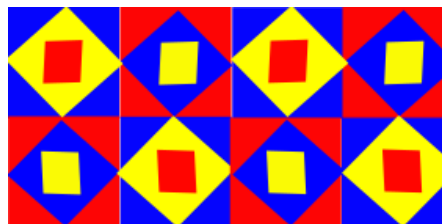
**PATTERNS**

### 2.6 Identify patterns in pictures and artistic designs.

Simple repeating, increasing or alternating patterns exist when there is a relationship between each new element in a series and the one before it.

When students identify a pattern, ask them to explain what makes it so. For example, ask them to explain what repeats. Students who are highly aware of patterns can spot this kind of regularity. They can reproduce patterns and predict how they will continue.

Patterns in artistic designs are all around us, for example in wall and floor coverings, table-cloths curtains and on clothing. Students can also look for patterns in pictures.



### 2.7 Create repeating patterns using actions, objects, colours and sounds.

Students will understand patterns better if they have the opportunity to make their own. The teacher's role is to provide appropriate tools and some guidance. The most important instruction is that items are repeated in a special way to make the pattern.

Exploration of patterns can start with real objects. For example
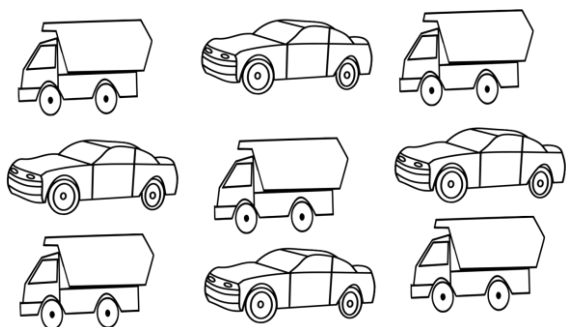


Blocks are good tools for making patterns.

Note there are many different ways of creating patterns from the blocks, as follows:
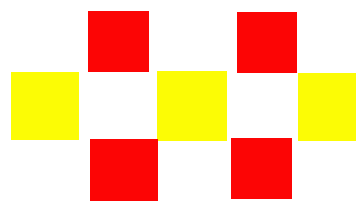


or



Patterns do not have to be linear.

Patterns do not have to be linear.



Students enjoy making patterns out of natural objects such as leaves.



They can make up a song with repeating lines adding actions to the song or they can create a repeating rhythm using clapping or a drum.

After experimenting with concrete objects, students should be able to make patterns on paper, for example by by shading in the squares of this grid using three different colours.
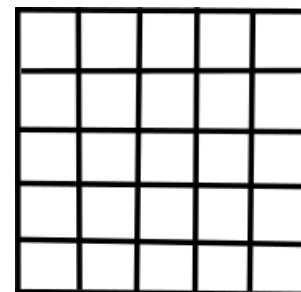
## 2.8 Create repeating patterns using shapes, letters and numbers..

Creating patterns with shapes, letters and numbers is more abstract than using real objects.

Give students a mixed group of shapes cut from coloured card and ask them to rearrange them into a pattern
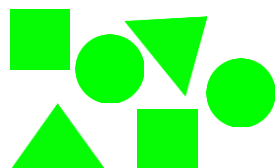
Students can be encouraged to make a variety of linear and non-linear patterns.

Patterns with numbers can be created in various ways. The main ones in for Infant 2 will be

Increasing or decreasing by 1

5, 6, 7, 8, 9

30, 29, 28, 27, 26

Increasing or decreasing by 2, 3 or another number.

3, 6, 9, 12, 15

38, 36, 34, 32, 30

Letters make patterns in a similar way to shape. For example:
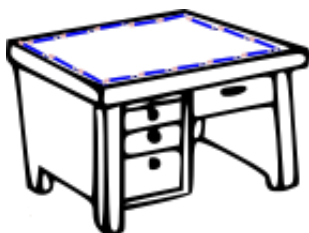
A G A G A G

Z P C Z P C

Patterns can also be made based on knowledge of the alphabet

Z, Y, X, V, W

A, C, E, G,

**MEASUREMENT A**

### 7.8 *Investigate the perimeter and area of 2-D shapes using non-standard measures.*

Perimeter - How many pencils are needed to go around the top of the student's desk?



Students can be encouraged to estimate before measuring.

Area - How many exercise books will it take to cover the teacher's desk?



Perimeter is a one-dimensional measurement that represents the distance around a closed geometric figure or shape (no gaps).

Area is a two-dimensional measurement that represents the amount of space inside a two-dimensional shape.

Non-standard measures used to measure area must also be two-dimensional, for example pieces of paper. The objects used to make the measurements should all be the same size.

### 7.9 *Measure the length of lines, perimeter of shapes and real objects found in the environment using the customary units of feet and inches.*

What is the perimeter of the garden bed below?
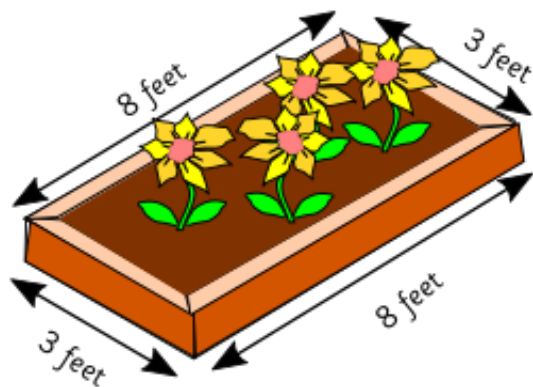


In the customary system of measurement, the common units to measure length include inch, foot, yard, and mile.

At this stage, students are not necessarily calculating using formulas. They can measure all the sides and add them together.

**MEASUREMENT A**

**7.10** *Investigate the volume of 3-D shapes using non-standard units of measurement.*

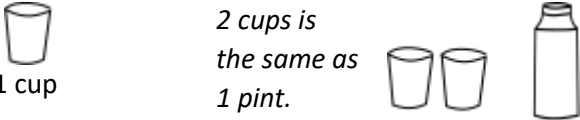How many crayons can fit into a box?

Explain to your students that measuring the volume of 3D shapes, is knowing the amount of space inside the 3D shape.

Using unifix (interlocking) cubes or similar manipulatives, construct a cuboid with a height of 3 blocks, a length of 4 blocks and a width of 5 blocks. Ask the students to break it apart and count the blocks.

**7.11** *Measure volume of containers using the customary units of cups and pints.*

The customary units for measuring volume are fluid ounces, cups, pints, quarts, and gallons. However, this learning outcome focuses on cups and pints.

Students should conduct experiments using real objects.

1 cup

*2 cups is the same as 1 pint.*

How many cups of water can be poured into a jug?

Milk is usually sold in pints.

It is not only liquid that can be measured using cups. Many cooking recipes measure dry ingredients such as flour and sugar in cups.

**7.12** *Measure the mass of objects using the customary units of pounds and ounces.*

This learning outcome can only be achieved if students weigh real objects. A scale will be required.

Once students can read the scale to the nearest whole pound, they can practice reading to the nearest half and quarter pound.
Finally, they can look at the smallest lines on the scale to read ounces.
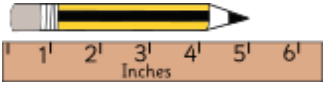
**7.13** *Compare the use of non-standard units to the use of customary units of measurement.*

Non standard unit of measure

Standard unit of measure

In infant one, students were introduced to measurement using non-standard measurements such as pencils, paper clips or parts of the body.

Once students understand the concept of measuring using non-standard measures, then standard units and measuring tools such as rulers can be introduced.

**ADDITION & SUBTRACTION A**

### 3.7 Add a 1-digit number to a 2-digit number that ends in a zero.

Essential previous knowledge for this learning outcome is that 2-digit numbers have a digit representing tens and another representing ones. This knowledge was reinforced in Numbers B.
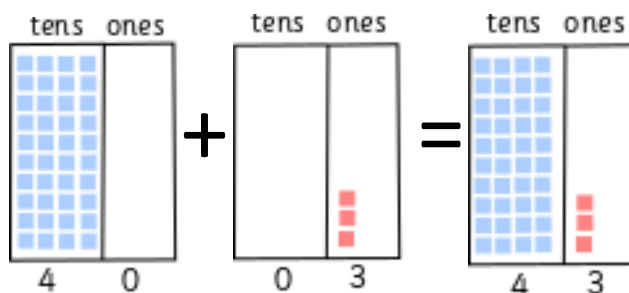
When adding a single digit number to a multiple of ten, such as 20, 30 and 40, the number in the tens column does not change.

20+7=27

70+5=75

40+3=43

This can be demonstrated as follows:



### 3.8 Add a 1- digit number to any 2-digit number with the answer not exceeding 99.

Students will make faster progress with addition if they can fluently count from 0 to 99.

This learning outcome is designed to be done mentally by "counting on".

At first, students should practice using examples that do not require a change in the tens column, for example:

23+4=27

76+1=77

12+7=19

Once this skill has been practiced and reinforced, students can begin to complete calculations requiring a change in the tens column.
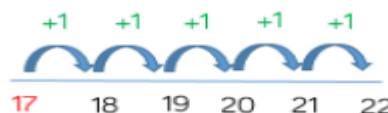
23+9=32

76+7=83

12+8=20

When doing addition that requires a change to the tens column (for example 19+2=21), students need to have a strong understanding of place value especially that ten ones are the same as one ten.

Students developing addition skills can use their fingers, real objects or a number line to help them.

17+5= 22

| | |
|---|---|
| **ADDITION & SUBTRACTION A** | **3.9 Add, mentally, without the use of manipulatives, multiples of 10, with the sum not exceeding 100.** |

| For example | Instruction needs to focus on the importance of the tens digit. If students struggle to complete this mentally, a 0-100 number chart can be used. Draw attention to the idea that the tens digit changes while the ones digit remains the same. |
|---|---|
| 20+20=40<br><br>40+20=60<br><br>20+50=70 | |

**3.10 Subtract a 1- digit number from a 2-digit number without the need to borrow.**

| Similar to Learning Outcome 3.8, the intention is to introduce subtraction by counting backwards. Students can also physically remove objects from a group.<br><br>Before attempting to subtract from a 2-digit number, students should practice subtracting one single digit number from another. Automaticity and fluency in this is a key skill that should be constantly practiced.<br><br>When students first do calculations with 2-digit numbers, these should not require a change in the tens column.<br><br>For example<br><br>14-2=12<br><br>66-4=62<br><br>but **not** 23-6=17. | Word problems should also be used. For example, if there are twenty-five students in the class and three leave, how many students are left?<br><br>If there are thirty-eight marbles in a jar and Michelle removes five, how many are left?<br><br>Using a number line to count backwards may help some students.<br><br>26-4=22<br><br>(26-1-1-1-1)<br><br><br><br>20 21 22 23 24 25 26 27 28 29 30 |

**MEASUREMENT B**
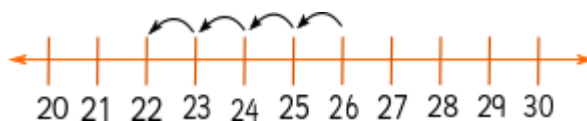
## 7.14 *Identify time as half hour, quarter hour to or past the hour using an analogue clock.*

The clocks below show time at the hour, quarter past the hour, half hour, and quarter to the hour on an analogue clock.
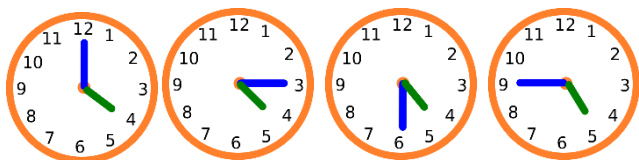


Students should practice using real clocks or ones they have made.

## 7.15 *Apply the terms a.m. and p.m. to time.*

A.M and P.M is not read from the clock, but rather from what time of day it is. A.M. runs from midnight (12:00) to 11:59 (one minute before noon). At noon, it becomes P.M, and P.M. goes from noon (12:00) to 11:59 (one minute before midnight).
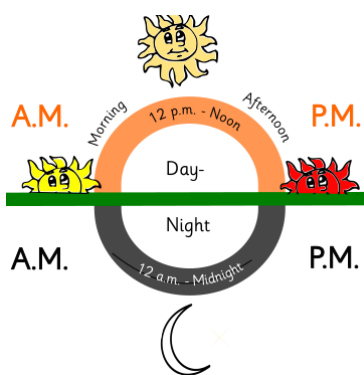


For young students, A.M. can be defined simply as the time before noon and P.M. as the time after noon.  It is not necessary for Infant 2 students to memorize the terms ante meridian and post meridian.

It is important to ensure students do not think the A in A.M. means "after" or that the M means "midnight".

Note that A.M. can also be correctly written as a.m. However A.m. would be incorrect.  It is now increasingly usual to see the abbreviations without the full stops.  However, Infant 2 should be taught to include them.

Examples:

I get up at seven A.M.

School finishes at two P.M.

## 7.16 Explore the relationship between seconds, minutes, hours, days, weeks and a year.

Use the words to complete the sentences.

*seconds, minutes, hours, day, days,*

*week, weeks, month, months, year, years*

There are 60_____in 1_____.

There are 7_____in 1 _____.

There are 24_____in 1 _____.

There are about 4 _____ in 1 _____ .

There are 52 _____ or 12 _____ in 1 _____.

Discuss units of time with students in terms of real-life scenarios they can relate to. For example, measure how long something lasts such as, how many seconds can you hold your breath, or how many minutes long is your favorite t.v. show?

Students can estimate how long something takes and then conduct a real world observation to confirm their estimates.  The teacher may have to help with this. Note that this activity can be revisited throughout the school year.

**MEASUREMENT B**

A good game is to ask students to count up to ten saying the names of different places while someone else times how many seconds it takes. Saying "One Dangriga, two Dangriga, three Dangriga . . . ten Dangriga" takes about ten seconds.

| Activity | Estimated Time | Observed Time |
|---|---|---|
| Jumping ten times. | | |
| Walking to the principal's office | | |
| Riding a bus from P.G. to Belmopan. | | |
| Eating breakfast. | | |
| Growing a bean plant | | |
| Playing a game of volleyball | | |

**7.17 Identify how many seconds have passed using the second hand of an analogue clock.**

Look at the red hand (second hand) on the clock and count how many times it moves from the time it moves from a point until it returns to that same point.



This builds on the knowledge that there are sixty seconds in a minute. It also depends on the understanding that, when looking at the second hand, each dash on the outside of the display equals one second.

**7.18 Identify the time to the nearest minute using both analogue and digital clocks.**

Both analogue and digital clock show fifteen minutes past four.



At this level, teachers can concentrate on the quarter hours – that is 15 minutes past, 30 minutes past and 45 minutes past (see learning outcome 8.14).

**ADDITION AND SUBTRACTION B**

**3.11 Add any two 2-digit numbers together with the answer not exceeding 100, vertically and horizontally with or without the use of a place value chart.**

A good understanding of place value is essential previous knowledge.

Calculating horizontally with two digit numbers is essentially the same skill as that of learning outcome 3.8. It can be done by counting on, using real objects as aids or using a number line.

Horizontally:  26+12=38

Adding vertically implies the use of pencil and paper. Students can start learning the essential skill of lining up the numbers correctly using single digit numbers. The next stage is adding a single digit to a 2-digit number.

```
  2        12
+ 3       + 3
  5        15
```

It is worthwhile spending time to ensure the numbers in the ones column are written exactly one underneath the other.

The final step is to introduce adding two 2-digit numbers, again taking time to ensure the numbers are lined up correctly – that is in the correct column.

```
  12
 +23
  35
```

At this stage, it is important NOT to introduce calculations that require regrouping. This is a new skill.

Focus on the language of tens and ones and look at different methods to add the numbers including the column method.

|   | tens | ones |
|---|------|------|
|   | 1    | 2    |
| + | 2    | 3    |
|   | 3    | 5    |

It is important that teachers always show the students to start with the ones when adding vertically.

**3.12 Subtract a single or 2-digit number from a 2-digit number, vertically and horizontally, without the need to borrow, with or without the use of a place value chart.**

A good understanding of place value is essential previous knowledge.

Subtracting horizontally can be done by counting backwards, using real objects as aids or using a number line.

Horizontally:  26-12=14

Subtracting vertically implies the use of pencil and paper. As with addition, it is vital that numbers are lined up in the correct tens and ones columns. Similarly, the first step should be with single digit numbers followed by subtracting a single from a two digit number.

The final step is to introduce subtracting two 2-digit numbers, again taking time to ensure the numbers are lined up correctly – that is in the correct column.

```
    3   2
  - 1   1
    2   1
```

At this stage, it is important NOT to introduce calculations that require borrowing. This is a new skill.

Focus on the language of tens and ones and look at different methods to add the numbers including the column method.

**ADDITION AND SUBTRACTION B**

```
    5              1   5
 -  3           -      3
 ─────         ─────────
    2              1   2
```

| tens | ones |
|------|------|
| 3 | 2 |
| - 2 | 1 |
| 1 | 1 |

It is worthwhile spending time to ensure the numbers in the ones column are written exactly one underneath the other.

It is important that teachers always show the students to start with the ones when subtracting vertically.

---

### 3.13 Complete number sentences with sums or differences up to 100 using the symbols +.-. =

A number sentence uses numerals and symbols to demonstrate a mathematical relationship, in this case, addition and subtraction.

78-45=33 is a valid number sentence.

Students should practice converting word problems into number sentences.

●●●●●●●●●●

First there were 10 red balls. Three red balls were taken away, leaving seven.

●●●●●●●.

Write a number sentence to show what happened.

The number sentence is 10-3=7

---

### 3.14 Explore the additive identity property that is if you add a number to 0, then the sum is the same number.

The **additive identity property** says that if you add a number to zero or add zero to a number, then you get the same number back.  The number zero is known as the identity element, or the additive identity.  This is because zero has no value.

7+0 = 7

53+0=53

72+0=72

0+28=28

It is not necessary for students to learn the phrase "additive identity property" as long as they understand the concept.
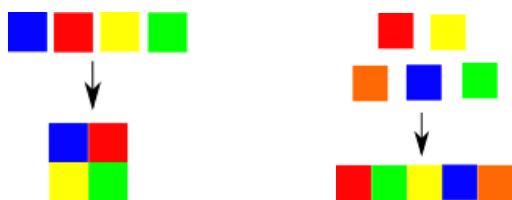
**FRACTIONS AND DECIMALS**

## 5.5 Compose and decompose a region, shape or set of objects using halves, thirds, quarters, and fifths.

Figures can be composed and decomposed to form other figures and shape.

Decomposing

Composing

Students apply their understanding from recognizing halves and quarters to finding thirds and fifths. They continue to use the language of the 'whole' and 'equal parts' to understand that one third is equal to one part out of three equal parts.

Cutting up a real object into equal parts is the same as decomposing it. This can be done with paper, fruit, cakes or other objects. Once an object has been decomposed, putting it back to make a whole is the same as composing.

Interlocking blocks such as lego or unifix cubes can be used.

## 5.6 Match pictures of fractional parts with the symbols ½, ⅓, ¼, and ⅕ .

Students need to know that a fraction has one number written above a line (the fractional line) and another number written below the line. The number above the fraction line (top number) is called the numerator and the number below (the bottom number) is called the denominator. These terms should be introduced at this stage but teachers can use more everyday language for clarity.

The denominator tells how many total parts there are in the whole. The 4 in ¼ indicates there are four total parts. The terms "quarter" and "fourths" should both be used.

The numerator indicates the selected (that is shaded) part. The 1 in 1/4 indicates one part is shaded.
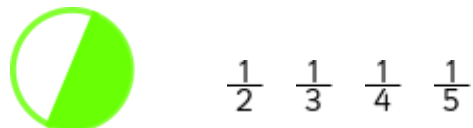
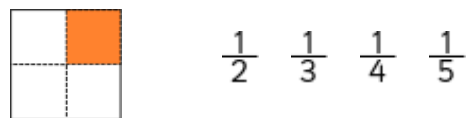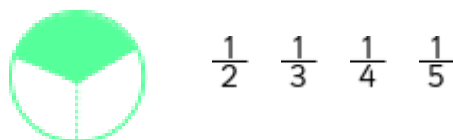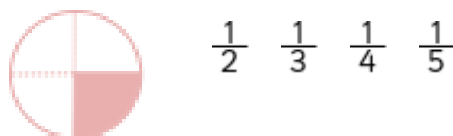In this diagram, one part is shaded and the total number of parts is four so the fraction shown is ¼.

¼

The position of the shaded part and the type of shape do not change the fraction. These are all ¼.

What fraction of each shape is coloured? Circle the correct answer.

$\frac{1}{2}$   $\frac{1}{3}$   $\frac{1}{4}$   $\frac{1}{5}$

$\frac{1}{2}$   $\frac{1}{3}$   $\frac{1}{4}$   $\frac{1}{5}$

$\frac{1}{2}$   $\frac{1}{3}$   $\frac{1}{4}$   $\frac{1}{5}$

$\frac{1}{2}$   $\frac{1}{3}$   $\frac{1}{4}$   $\frac{1}{5}$

$\frac{1}{2}$   $\frac{1}{3}$   $\frac{1}{4}$   $\frac{1}{5}$
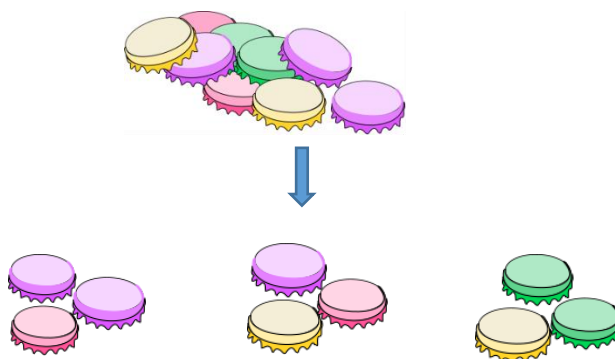
**MULTIPLICATION AND DIVISION**

### 4.1 Place up to 50 objects into groups of equal size.

This is designed to be a hands-on learning outcome using piles of small real objects such as bottle tops, beans, unit blocks, one-cent coins and counters.

The intention of this learning outcome is that there should be no remainders.

Make groups of three from these bottle tops.



### 4.2 Divide groups into equal parts using real objects or pictures.

The main difference between learning outcomes 4.1 and 4.2 is the progression from real objects to more abstract representations.

Students may understand division more easily if it is introduced as sharing.

Word problems can be introduced. "If Mikel has six crayons and he wants to share them equally with three friends, how many crayons will each friend get?"

**MULTIPLICATION AND DIVISION**
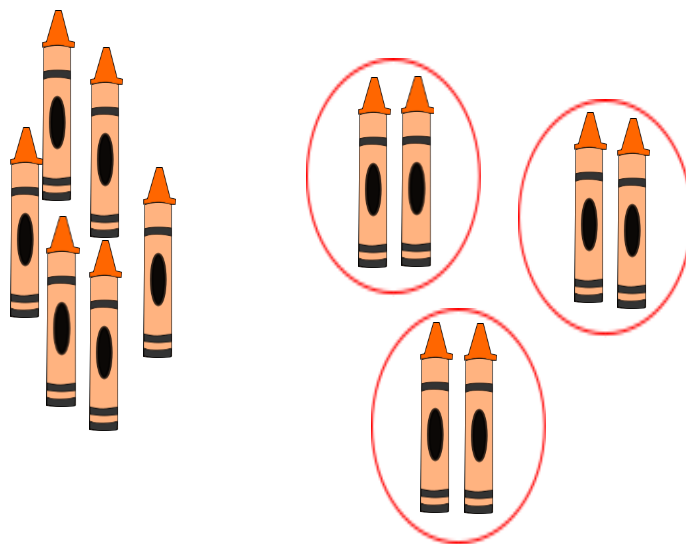
## 4.3 Investigate that multiplication is the same as repeated addition.

This is the first time students have been introduced to the concept of multiplication. Teachers should not expect students to grasp the concept immediately. For some students, this may take some time and will require daily practice. It is essential that real objects are used.

Look at these groups of bottle tops.



They can be added together (2+2+2+2) which equals 8.

However, we can also say there are 4 groups with 2 bottle tops in each.

4 times 2 equals 8.

After using real objects, students can interpret pictures of the same concept.
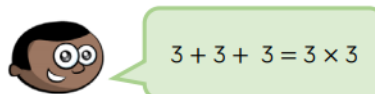
The picture below shows five bags of apples. There are three apples in each bag.



**3+3+3+3+3=15**

This is the same as 5 times 3 equals 15.

The times symbol (x) should also be introduced.



$3 + 3 + 3 = 3 \times 3$

Students can also look at tiles. This room has five rows of four tiles. You can add the rows to get the total number of tiles: 4+4+4+4+4=20. This is the same as 5 x 4 = 20.

## 4.4 Multiply two 1-digit numbers together using manipulatives arranged in groups, multiplication arrays and so on.

An array is an arrangement of objects, pictures or numbers in columns or rows. Arrays help students visualize multiplication.

Multiplication using an array



5 x 5 = 25

Students can be given a pile of real objects such as beans. They can be asked to arrange them in rows and columns of equal lengths.
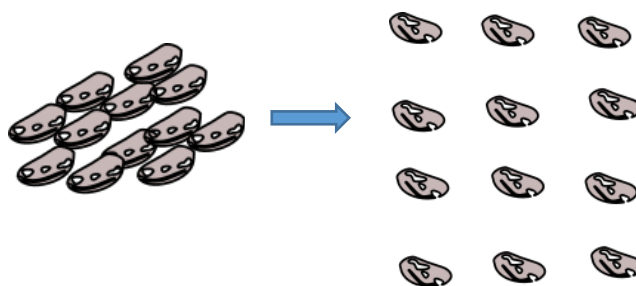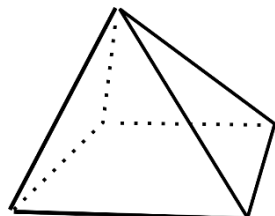


This shows that 4x3 =12.

Point out that 3x4 also equals 12.

**GEOMETRY B**

## 6.12 Create models of 3-D shapes and objects with specified properties, such as number of faces.



Cubes have six faces. Each face is a square.

Square pyramids have five faces.



The easiest way of creating 3-D shapes is to use play-dough or modelling clay. A fun activity is to use marshmallow and tooth picks or pieces of spaghetti.

Students can use their knowledge of 2D shapes to identify the shapes of faces on 3D shapes.

Making models will help students develop the skill of visualizing 3D shapes from a 2D representation.

## 6.13 Compare 2-D shapes according to specific properties including length of sides, number of vertices and the approximate size of their internal angles.

It is not necessary for students to measure the size of an angle in degrees to achieve this learning outcome. It is sufficient to notice that the angles in the triangle below are smaller than those of the square.
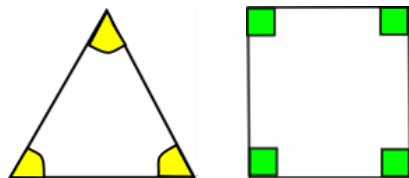


Recognizing and naming 2D shapes in different orientations and being able to differentiate between them is important.

2D shapes are actually flat and so cannot be handled or picked up.

Complete this chart:

| Shape | Name | Number of Sides | Number of Corners |
|---|---|---|---|
| △ | | | |
| ▢ | | | |
| ⬠ | Pentagon | | |
| ⬡ | Hexagon | | |

Ask students to find out how many sides a dollar coin has. Ask them to find out the name of this shape.

**GEOMETRY B**

**6.14 Investigate the similarities and differences between symmetrical shapes.**

If a figure can be folded or divided into half so that the two halves match exactly then such a figure is called a symmetric figure.

For example:

Cut out the shapes below. Fold along the dotted lines. The shape is symmetrical if the two halves match exactly.

| Symmetrical |
| --- |
|  |

| Not Symmetrical |
| --- |
|  |

The concept of symmetry can be introduced using art. Fold a piece of paper in half for the students. Ask them to paint one half of a butterfly on one side while leaving the other side blank. Before the paint dries, they should fold the two halves together. This should create a whole butterfly with the two halves being the same.
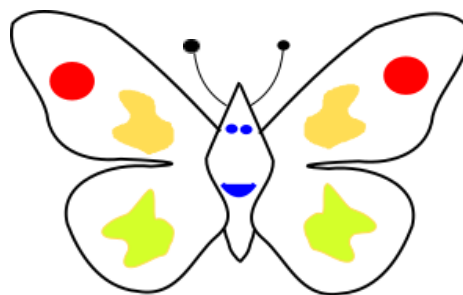


Students should look for symmetry in the classroom and wider environment. Investigate if people's faces are symmetrical.

There are a range of practical resources that can be used to introduce students to the concept of shapes being halved on their line of symmetry, such as mirrors and geoboards.

**DATA**

## 9.4 Gather data from picture and written sources and the environment through observation.

This learning outcome is designed to develop the skill of accurate observation. Students should be given the opportunity to leave their classroom to collect data. For example they can:

- count the number of windows on a school building;
- count the bicycles parked at school, noting the colour of each one;
- count the plants in the garden, noting the number of each type.

A variety of sources can be used such as:

- types of animals in a picture
- number and colours of vehicles in a street scene
- types of buildings on a street (houses, shops, and so on.)
- gender of students in the playground.
- colour of cups students use to drink water.

## 9.5 Organize and display data using concrete materials in tally charts and column representations.

Tally charts were introduced in infant one.

Students can make a tally chart based on the data collected in learning outcome 11.4.

### Colours of Bicycles at School

| | | |
|---|---|---|
| red | ● | ⳤⳤⳤⳤ |
| blue | ● | /// |
| black | ● | ⳤⳤⳤⳤ / |
| green | ● | // |
| yellow | ● | /// |

This same data can be used to make a column graph.



Colours of Bicycles at School
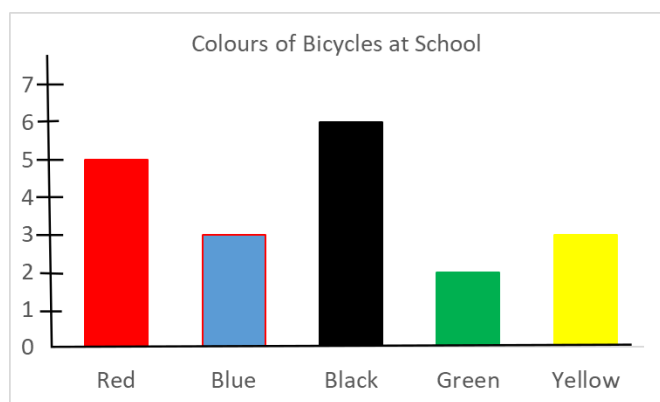
For tally charts, students need to learn to make a single mark for 1, 2, 3 and 4 and then cross these four marks from left to right to indicate 5, as follows:



They can use this to practice counting by fives.

Graphs are a common method to visually display data.

The key point when introducing column graphs is that each column represents a certain number of items and that this is read from the side (y-axis). This may be a new concept for some students.

It can be introduced by physically building columns of blocks. This column represents 3.

| | |
|---|---|
| **9.6 Interpret information presented in simple column graphs using a variety of data sets.** | |

To interpret a graph or chart, read the title, look at the key, read the labels. Then study the graph to understand what it shows.

This learning outcome can use the same data that the students collected for the previous section. Using data they have collected makes learning more meaningful.

Colours of Bicycles at School

Red 5, Blue 3, Black 6, Green 2, Yellow 3
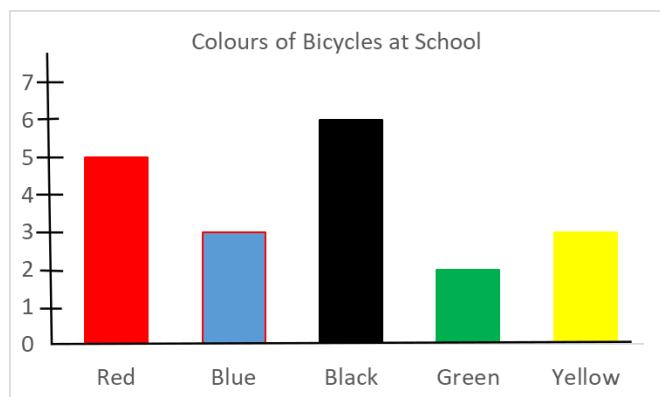
Questions can relate to interpreting a single piece of data:

*How many yellow bicycles are there?*

Questions can also require students to compare using greater or less than or most and fewest.

*Is the number of green bicycles greater or less than the number of red bicycles?*

*Which colour has the most number of bicycles?*

Finally students can use addition and subtraction.

*What is the total of red and green bicycles added together?*

*How many more black bicycles are there than yellow ones?*

**9.7 Make predictions using graphs.**

**Content Examples &Teaching Points**

A prediction is more than just a guess. It is a guess based on looking at information we already have.

What is the weather most likely to be on Friday?

| Monday | Tuesday | Wednesday | Thursday | Friday |
|---|---|---|---|---|
| rain | sun | sun | sun | |

One way of making a prediction is to look at the outcome that occurs most often. This is the one most likely to occur again.