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**ESSENTIAL  
EXERCISES**

**YEAR 6**

**M A T H S**

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**NOTE:** The New Australian National Curriculum has been split into 3 major strands:

- Ⓐ Number & Algebra      Ⓑ Measurement & Geometry      Ⓒ Statistics & Probability

In the Year 6 content descriptions, these 3 major strands have been further subdivided into the sub-strands shown above.

## THE NEW NATIONAL AUSTRALIAN CURRICULUM

The authors acknowledge the dedicated work of the Australian Curriculum, Assessment and Reporting Authority (ACARA) and the many others who have contributed to the development of the Australian curriculum in response to the aims of the 2008 Melbourne Declaration on Educational Goals for Young Australians.





**This book provides a summary and interpretation of their guidelines for those interested in developing mathematical understanding in Year 6 students.**

The Australian National Curriculum, developed by ACARA, states that, by the end of Year 6, students should be able to do the following:

- Recognise the properties of prime, composite, square and triangular numbers.
- Describe the use of integers in everyday contexts.
- Solve problems involving all four operations with whole numbers.
- Connect fractions, decimals and percentages as different representations of the same number.
- Solve problems involving the addition and subtraction of related fractions.
- Make connections between the power of 10 and the multiplication and division of decimals.
- Describe rules used in sequences involving whole numbers, fractions and decimals.
- Connect decimal representations to the metric system and choose appropriate units of measurement to perform a calculation.
- Make connections between capacity and volume.
- Solve problems involving length and area.
- Interpret timetables.
- Describe combinations of transformations.
- Solve problems using the properties of angles.
- Compare observed and expected frequencies.
- Interpret and compare a variety of data displays including those displays for two categorical variables.
- Evaluate secondary data displayed in the media.
- Locate fractions and integers on a number line.
- Calculate a simple fraction of a quantity.
- Add, subtract and multiply decimals and divide decimals where the result is rational.
- Calculate common percentage discounts on sale items.
- Write correct number sentences using brackets and order of operations.
- Locate an ordered pair in any one of the four quadrants on the Cartesian plane.
- Construct simple prisms and pyramids.
- List and communicate probabilities using simple fractions, decimals and percentages.

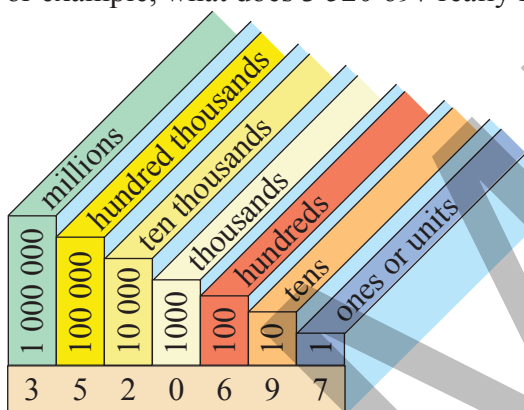
## NUMBER AND PLACE VALUE

The "Australian Curriculum Mathematics" (ACM) references for this sub-strand of "Number and Algebra" (NA) are below:

-  Identify and describe properties of prime, composite, square and triangular numbers (ACMNA 122).
-  Select and apply efficient mental and written strategies and appropriate digital technologies to solve problems involving all four operations with numbers (ACMNA 123).
-  Investigate everyday situations that use positive and negative whole numbers and zero. Locate and represent these numbers on a number line (ACMNA 124).
-  Note: We are also including substantial revision of Year 5 work.

### ◆ PLACE VALUE

Since this chapter deals with WHOLE NUMBERS, the first important idea is to understand the value of each of the different columns. Our number system today is based on the Hindu-Arabic system where the VALUE of a number is determined by its PLACE in a particular column. For example, what does 3 520 697 really mean?



It can be seen that each column has a different PLACE VALUE.



The place value of 9 is 90 or ninety.  
The place value of 2 is 20 000 or twenty thousand.  
The place value of 6 is 600 or six hundred.

These are 3 ways or notations of describing a whole number:

- AS AN ORDINARY NUMERAL: 3 520 697
- IN WORDS: Three million, five hundred and twenty thousand, six hundred and ninety seven.
- IN EXPANDED NOTATION:  $(3 \times 1\,000\,000) + (5 \times 100\,000) + (2 \times 10\,000) + (0 \times 1\,000) + (6 \times 100) + (9 \times 10) + (7 \times 1)$

### ◆ FACTORS

A factor is a number which leaves no remainder after division.

The factors of 12 are { 1, 2, 3, 4, 6, 12 }.

### ◆ HIGHEST COMMON FACTOR (HCF)

This is the highest factor which is common to 2 or more numbers.

**Example:** Find the highest common factor of 12 and 20.

Factors of 12 are {1, 2, 3, 4, 6, 12}.

Factors of 20 are {1, 2, 4, 5, 10, 20}.

∴ The HCF of 12 and 20 is 4.

## ❖ MULTIPLES

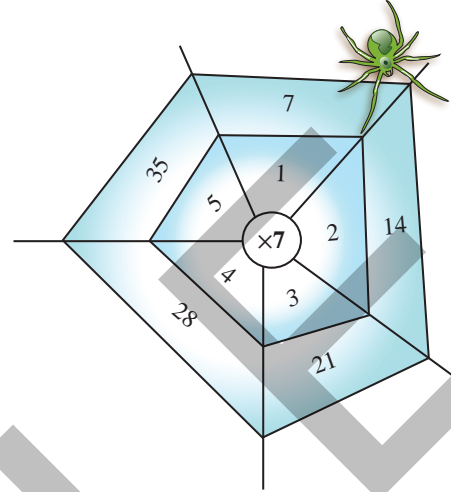
To find the multiples of a particular number, simply multiply it by the counting numbers.

Say we wished to find the first 5 multiples of 7.

$$\begin{aligned}1 \times 7 &= 7 \\2 \times 7 &= 14 \\3 \times 7 &= 21 \\4 \times 7 &= 28 \\5 \times 7 &= 35\end{aligned}$$

**OR**  
We can  
draw a  
WEB:

The first 5 multiples of 7  
are {7, 14, 21, 28, 35}.



## ❖ LOWEST COMMON MULTIPLE (LCM)

This is the lowest multiple which is common to 2 or more numbers.

**Example:** Find the LCM of 8 and 10.

Multiples of 8 are {8, 16, 24, 32, 40, 48, ...}.

Multiples of 10 are {10, 20, 30, 40, 50, ...}.

∴ The LCM of 8 and 10 is 40.

## ❖ AVERAGE

The average of a set of scores is obtained by finding the total, and dividing by the number of scores.

$$\text{The average of 7, 11 and 15} = \frac{7 + 11 + 15}{3} = \frac{33}{3} = 11.$$

Please refer to  
Appendix for a  
more detailed  
explanation.



## ❖ PRIME AND COMPOSITE NUMBERS

All counting numbers from 2 onwards (i.e. 2, 3, 4, 5, 6, .....etc.) can be split up into two major groups of numbers, which are called either PRIME or COMPOSITE.

A prime number is any counting number which has only 2 factors, itself and 1.

A composite number has more than 2 factors.

Note: The number 1 is neither prime nor composite.

**Example:** State whether the following numbers are prime or composite:

- (a) 15      (b) 11      (c) 19      (d) 27

**Solutions:** (a) 15 is COMPOSITE because it has more than 2 factors {1, 3, 5, 15}.

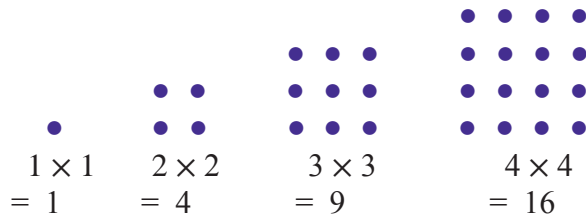
(b) 11 is PRIME because it has only 2 factors {1, 11}.

(c) 19 is PRIME because it has only 2 factors {1, 19}.

(d) 27 is COMPOSITE because it has more than 2 factors {1, 3, 9, 27}.

## ❖ SQUARE NUMBERS

These are obtained from squaring each of the counting numbers. To square a number means to multiply the number by itself.  $1 \times 1, 2 \times 2, 3 \times 3, 4 \times 4, 5 \times 5 \dots 1^2, 2^2, 3^2, 4^2, 5^2$ , etc.  
or **1, 4, 9, 16, 25, 36, 49**, etc.

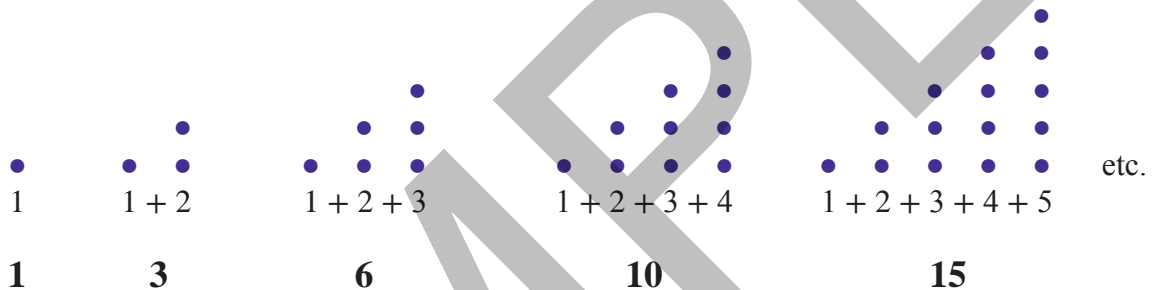


Square numbers get their name because the pattern of dots forms a square.



## ❖ TRIANGULAR NUMBERS

These can be obtained by starting with the number 1, and then adding on the next counting number, as shown below. They can also be obtained from building up triangles from dots – this is how they got their name. When you add on the next column of dots, you simply get the picture of a bigger triangle.



## ❖ ROUNDING OFF

In some situations in Maths, particularly when using a calculator, we do not require the exact answer, but an approximate answer only. The question will then ask you to **ROUND OFF** the given number to the nearest ten, nearest hundred or nearest thousand.

### Examples:

If we round off 73 to the nearest ten, then the answer is 70, because 73 is closer to 70 than it is to 80.

If we round off 659 to the nearest hundred, then the answer is 700, because 659 is closer to 700 than it is to 600.

## ❖ ESTIMATING

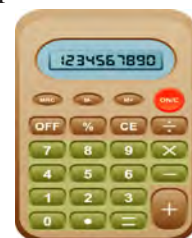
When using a calculator, you will be surprised how easy it is to press the wrong button and then get a ridiculous answer which is way out from the correct answer. If we quickly and mentally estimate an approximate answer to begin with, then this will prevent us from making careless blunders.

Estimate the answer to  $469 + 1\,728$ .

469 rounds off to 500.

1 728 rounds off to 1 700.

Therefore ESTIMATE =  $500 + 1\,700$   
= 2 200



## ❖ PROBLEM SOLVING (See “Appendix” for some strategies)

Problem solving questions are becoming an increasingly important part of the Mathematics syllabus. These sentence type questions are not straight forward, and they usually require the student to interpret the information given, and then to use one or more thinking skills to solve the problem. It will also often involve 2 or more operations (+, −, ×, ÷) to find the solutions. Some important strategies for ‘Problem Solving’ are to be found in chapter 1 of the ‘Understanding Year 6 Maths’. Students should also have an understanding of the meaning of some important words given below:



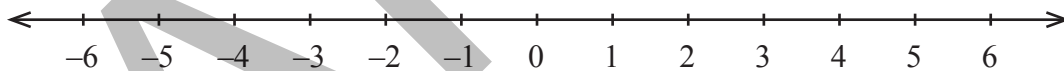
Sum, difference, product, quotient, descending, ascending, average (see Appendix)

## ❖ NEGATIVE NUMBERS (See “Appendix” for more information)

So far in your schooling and education in the subject of Mathematics, we have only been using the set of whole numbers going from 0, 1, 2, 3, 4, etc. However, there are many situations in life where we have to deal with “opposite” or “negative numbers”.

**Examples:** Temperatures above and below zero degrees.  
The amount of money which we have, and the amount we owe.  
In science, the charges on protons and electrons.  
Heights above sea level, and heights below sea level.

In order to do these types of problems, we have to introduce negative numbers, which are the opposite of positive numbers. Negative numbers are numbers less than 0 or zero. These can be shown on a number line in the following way:

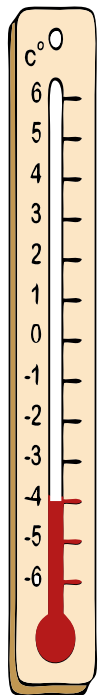
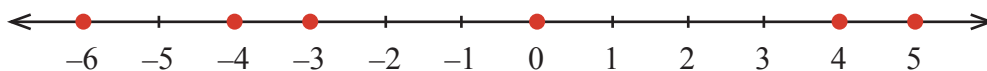


For example,  $-4$  reads as “minus 4” or “negative 4”  
and  $+4$  reads as “plus 4” or simply 4.  
Can you see that 4 is 4 units to the right of zero, and  $-4$  is 4 units to the left of zero?  
That is why we call them opposites.  
With positive numbers we do not need to write in the plus sign.

To graph a number on the number line, simply place a bold dot at that position on the number line.

**Example:** Graph the following numbers on the same number line  $\{+5, -3, -6, 4, 0, -4\}$

**Solution:**



The set of whole numbers, plus the set of negative numbers, is called the set of INTEGERS.



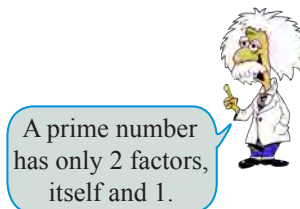
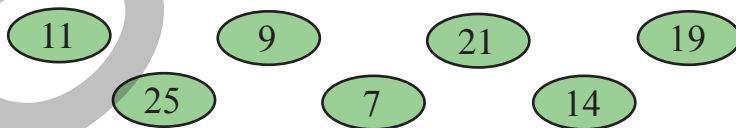
**For further reference, see ‘Understanding Year 6 Maths’ by W. Marlin**



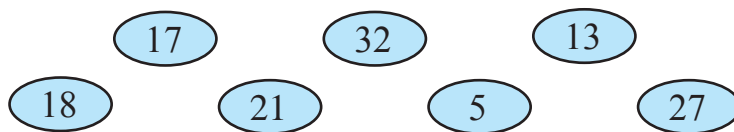


1. Write the following numbers as ordinary numerals.
  - a) Twenty thousand, five hundred and forty two
  - b) Four thousand, six hundred and eighteen
  - c) Nineteen thousand, one hundred and seven
  - d) Thirty nine thousand, eight hundred and sixty five
2. Write the following numbers in words.
  - a) 10 493
  - b) 25 906
  - c) 32 749
  - d) 68 015
3. Write the place value for each underlined numeral.
  - a) 5 924
  - b) 2 7 609
  - c) 17 2 38
  - d) 1 08 615
4. Write the following numerals in expanded notation.
  - a) 8 145
  - b) 14 253
  - c) 39 745
  - d) 782 631
5. List all the factors of the following numbers.
  - a) 6
  - b) 14
  - c) 28
  - d) 45
6. Find the HCF (highest common factor) of the following pairs of numbers.
  - a) 12 and 15
  - b) 6 and 24
  - c) 15 and 25
  - d) 32 and 40
7. List the first 5 multiples of the following numbers.
  - a) 5
  - b) 7
  - c) 8
  - d) 6
8. Find the LCM (lowest common multiple) of the following pairs of numbers.
  - a) 4 and 8
  - b) 6 and 10
  - c) 8 and 7
  - d) 9 and 5

9. Cross out all the prime numbers.



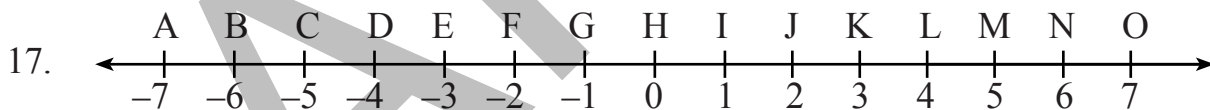
10. Cross out all the composite numbers.





11. Find:  
 a)  $2^2$                       b)  $3^2$                       c)  $4^2$                       d)  $5^2$
12. Continue the pattern below.  
 $1 + 2 = 3$                $1 + 2 + 3 = 6$                $1 + 2 + 3 + 4 = 10$                         ?
13. Round off the following numbers to the nearest ten and estimate the answer.  
 a)  $216 + 93$               b)  $315 - 194$               c)  $1\,628 + 672$
14. Round off the following numbers to the nearest hundred and estimate the answer.  
 a)  $249 + 351$               b)  $852 - 437$               c)  $1\,550 - 978$
15. Find the average: **Note:** Add up all the scores first, and then divide the sum by the number of scores.  
 a) 6 and 10              b) 14 and 22              c) 8, 9 and 7

16. Find:
- |  |  |  |   |
|--|--|--|---|
| a) $\begin{array}{r} 3\,479 \\ 2\,910 \\ + 1\,548 \\ \hline \end{array}$ | b) $\begin{array}{r} 4\,482 \\ 5\,715 \\ + 2\,346 \\ \hline \end{array}$ | c) $\begin{array}{r} 75\,123 \\ 2\,468 \\ + 49\,567 \\ \hline \end{array}$ | d) $\begin{array}{r} 24\,536 \\ 62\,194 \\ + 19\,768 \\ \hline \end{array}$ |
| e) $\begin{array}{r} 8\,655 \\ - 5\,234 \\ \hline \end{array}$           | f) $\begin{array}{r} 7\,986 \\ - 3\,572 \\ \hline \end{array}$           | g) $\begin{array}{r} 19\,744 \\ - 12\,588 \\ \hline \end{array}$           | h) $\begin{array}{r} 62\,783 \\ - 41\,284 \\ \hline \end{array}$            |
| i) $99 \times 10$  | j) $128 \times 9$  | k) $344 \times 16$   | l) $592 \times 24$  |
| m) $6 \overline{)426}$   | n) $9 \overline{)891}$   | o) $4 \overline{)648}$   | p) $5 \overline{)587}$  |



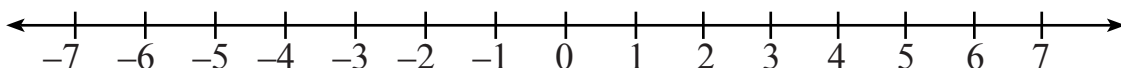
Using the number line above write down the numbers at the following positions:

- |      |      |      |      |
|------|------|------|------|
| a) G | b) K | c) B | d) M |
| e) A | f) H | g) J | h) E |

The numbers to the right of zero are positive numbers, and the numbers to the left of zero are negative numbers.



18. Plot the following numbers on the number line shown by using a solid dot.  
 $\{-3, -2, -5, 5, 6, -7\}$





These are the answers!

Level  
1

NUMBER AND  
PLACE VALUE

Easier

1. a) 20 542      b) 4 618      c) 19 107      d) 39 865
2. a) Ten thousand, four hundred and ninety three  
b) Twenty five thousand, nine hundred and six  
c) Thirty two thousand, seven hundred and forty nine  
d) Sixty eight thousand and fifteen
3. a) 6 000      b) 20 000      c) 200      d) 100 000
4. a)  $(8 \times 1\,000) + (1 \times 100) + (4 \times 10) + (5 \times 1)$   
b)  $(1 \times 10\,000) + (4 \times 1\,000) + (2 \times 100) + (5 \times 10) + (3 \times 1)$   
c)  $(3 \times 10\,000) + (9 \times 1\,000) + (7 \times 100) + (4 \times 10) + (5 \times 1)$   
d)  $(7 \times 100\,000) + (8 \times 10\,000) + (2 \times 1\,000) + (6 \times 100) + (3 \times 10) + (1 \times 1)$
5. a) {1, 2, 3, 6}      b) {1, 2, 7, 14}  
c) {1, 2, 4, 7, 14, 28}      d) {1, 3, 5, 9, 15, 45}
6. a) Factors of 12 = {1, 2, 3, 4, 6, 12}      b) Factors of 6 = {1, 2, 3, 6}  
Factors of 15 = {1, 3, 5, 15}      Factors of 24 = {1, 2, 3, 4, 6, 8, 12, 24}  
 $\therefore$  HCF = 3       $\therefore$  HCF = 6
- c) Factors of 15 = {1, 3, 5, 15}      d) Factors of 32 = {1, 2, 4, 8, 16, 32}  
Factors of 25 = {1, 5, 25}      Factors of 40 = {1, 2, 4, 5, 8, 10, 20, 40}  
 $\therefore$  HCF = 5       $\therefore$  HCF = 8
7. a) {5, 10, 15, 20, 25}      b) {7, 14, 21, 28, 35}  
c) {8, 16, 24, 32, 40}      d) {6, 12, 18, 24, 30}
8. a) Multiples of 4 = {4, 8, 12, 16, 20, 24.....}      b) Multiples of 6 = {6, 12, 18, 24, 30, 36...}  
Multiples of 8 = {8, 16, 24....}      Multiples of 10 = {10, 20, 30, 40....}  
 $\therefore$  LCM = 8       $\therefore$  LCM = 30
- c) Multiples of 8 = {8, 16, 24, 32, 40, 48, 56....}      d) Multiples of 9 = {9, 18, 27, 36, 45...}  
Multiples of 7 = {7, 14, 21, 28, 35, 42, 49, 56....}      Multiples of 5 = {5, 10, 15, 20, 25,  
30, 35, 40, 45....}  
 $\therefore$  LCM = 56       $\therefore$  LCM = 45
- 9.