MURANG'A UNIVERSITY OF TECHNOLOGY
DEPARTMENT OF MATHEMATICS AND ACTUARIAL SCIENCE
Programme: Diploma in Supply Chain Management/
Business Management, Marketing Level 6 (TVET)
Unit Code: BUS/MKT/BC/2/6

Unit name: Numeracy Skills

1.0 Numeracy Skills

Numeracy skills refer to the ability to use, interpret and communicate mathematical information to solve real-world problems.

These include the ability to understand basic math like addition, subtraction, division and multiplication. More advanced numeracy skills incorporate the use of graphical, statistical and algebraic concepts and the ability to interpret that data and apply it to real-world situations.

Examples of numeracy skills

Numeracy skills can include a wide range of abilities to understand and analyse information. Here are some main numeracy skills that you may regularly use in a work environment.

- Basic knowledge of numbers
- Calculation skills
- Budgeting
- Interpreting mathematical information
- Understanding the relationships between numbers
- Understanding trends
- Measurement and data analysis

What are Numbers?

The word '*numbers*' refer to numerical '*digits'* or '*numerals' usually used* to refer to the digits in a 'numerical system'**.**

Digits are unique symbols or characters (such as ‘0’, ‘1’, ‘3’ or ‘7’), that are used alone or in groups (such as ‘37’ or ‘1073’) to identify a *number*.
For example, you might have heard the term ‘Roman numerals’. The Roman system is an ancient system that uses letters, such as I, V and X and is sometimes still used today. We will look at some examples later.

However, the numerals that many of us are familiar with are from the base 10 system, also known as the ‘decimal’ system. These are the numerals 0 (zero) through to 9 (nine). We don’t usually refer to these as ‘numerals’ because it is the system that we use most of the time.

Fundamentals of Mathematics

Classification of numbers

Integers - Any of the positive and negative whole numbers, **..., $^{-}$3, $^{-}$2, $^{-}$1, 0, $^{+}$1, $^{+}$2, $^{+}$3, ...** The positive integers, 1, 2, 3..., are called the natural numbers or counting numbers. The set of all integers is usually denoted by Z or Z+

Digits - the 10 symbols 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9, used to create numbers in the base 10 decimal number system.

Natural Numbers – these are counting numbers and the positive integers. They are:

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17...

Rational Numbers - any number that is either an integer "a" or is expressible as the ratio of two integers, a/b. The numerator, "a", may be any whole number, and the denominator, "b", may be any positive whole number greater than zero. If the denominator happens to be unity, b = 1, the ratio is an integer. If "b" is other than 1, a/b is a fraction.

Fractional Numbers - any number expressible by the quotient of two numbers as in a/b, b>1, where "a" is called the numerator and "b" is called the denominator. If "a" is smaller than "b" it is a proper fraction. If "a" is greater than "b" it is an improper fraction which can be broken up into an integer and a proper fraction.

Irrational Numbers - any number that cannot be expressed by an integer or the ratio of two integers. Irrational numbers are expressible only as decimal fractions where the digits continue forever with no repeating pattern. Some examples of irrational numbers are $\sqrt{2}$ and $\sqrt{3}$

Real Numbers - the set of real numbers including all the rational and irrational numbers.

Prime Numbers- is a number that can only be divided by one and itself. Examples of prime numbers are 2,3,5,7,11,13,17,19,23, and 29.

Common Mathematical Symbols

Addition, Plus, Positive (+)

Addition is a term used to describe that two or more numbers should be added together. The addition symbol (+) is usually used to denote an addition, for example, 2 + 2. The word 'sum' or the symbol ∑ may also be used for addition. Numbers can be added either vertically or horizontally.

Subtraction, Minus, Negative (−)

Subtraction is a term used to describe how we "take away" one or more numbers from another. It is also used to find the difference between two or more numbers and is performed in a similar manner with addition. This symbol has two main uses in mathematics:

1) **Negative (−)** is used when one or more numbers are to be subtracted, for example,

   5− 2.

2) The (−) symbol is also commonly used to show a minus or negative number, such as −2.

Column/ Vertical Addition

When adding lots of numbers together it is helpful to write them in columns, denoting units, tens and hundreds. If we needed to add **4, 15, 23, 24, 35, 42**

Step: Arrange the numbers in columns, Hundreds, Tens and Units as needed and add:

	Tens	Units
		4
	1	**5**
	2	**3**
	2	**4**
	3	**5**
+	**4**	**2**
1	**4**	**3**

<u>Horizontal Addition</u>

Horizontal addition is a summation strategy that breaks down the summands by taking note of the positional value and continuing with the addition. The sums in the addition chain do not mix the positional values hence making it easier for learners to comprehend the addition. This means that thousands are added to the thousands, hundreds to hundreds, tens to tens *e.t.c*

<u>Multiplication (‘×’)</u>

Multiplication is represented by the signs cross ‘×’, asterisk ‘*’ or dot ‘·’. When we multiply two numbers, the answer we get is called ‘product’. The number of objects in each group is called ‘multiplicand,’ and the number of such equal groups is called ‘multiplier’. For example, 8×6=48

8=multiplier 6=multiplicand 48=product

Properties of multiplication

Commutative Property: When we multiply two numbers, the order doesn't matter. For numbers a and b, $a \times b = b \times a$.

Associative Property: For numbers a, b, and c, $(a \times b) \times c = a \times (b \times c)$.

Distributive Property: For numbers a, b, and c, $a \times (b + c) = (a \times b) + (a \times c)$.

Multiplying Negative Numbers

Multiplying a negative by a positive number always yield a negative answer for example,

$20 \times (-5) = -100$

Multiplying two negative numbers gives positive answer for example, **$(-20) \times (-5) = 100$**

Division

The usual written symbol for division is (÷). In spreadsheets and other computer applications the forward slash (/) symbol is used. **Division is the opposite of multiplication in mathematics.**

Rule about Division

1. When you divide 0 by another number the answer is always 0. For example: $0 \div 2 = 0$. That is 0 sweets shared equally among 2 children - each child gets 0 sweets.

2. When you divide a number by 0 you are not dividing at all (this is quite a problem in mathematics). $2 \div 0$ is not possible. You have 2 fruits but no children to divide them among. You cannot divide by 0.

3. When you divide by 1, the answer is the same as the number you were dividing. $2 \div 1 = 2$. Two sweets divided by one child.

4. Any number divided by the same number is 1. $20 \div 20 = 1$. Twenty sweets divided by twenty children - each child gets one sweet.

5. Numbers must be divided in the correct order. $10 \div 2 = 5$ whereas $2 \div 10 = 0.2$. Ten sweets divided by two children is very different to 2 sweets divided by 10 children.

6. All fractions such as ½, ¼ and ¾ are division sums. ½ is $1 \div 2$. One sweet divided by two children.

Division of Negative Numbers

Dividing a negative by a positive number always yield a negative answer for example,

20 / (-5) = -4 or (-20)/5= -4

Dividing two negative numbers gives positive answer for example, **(-20) / (- 5) = 4**

2.0 Fractions and Decimals

Fractions and decimals are two different ways to represent parts of a whole number. Decimals are a way to express tenths, hundredths, thousandths of a unit. Decimals extend the number system beyond the simple ‘hundreds, tens, units’ into ‘tenths of units’, ‘hundredths of units’ and so on. Working with decimals is therefore essentially the same as working with any other number. If you were adding numbers without decimals, you would start with the units, and move along to tens, then thousands and so on. The same rule applies if there are decimals. Add them first, then units, then tens and so on.

NB: The most important rule to remember is to ***line up the decimal points*** in your calculation**,** ensuring that the decimal point in the answer also lines up with the decimal points above it.

Example 1 - Straightforward addition

123.5 + 234.2= 357.7

As for any addition calculation, align the numbers and add the columns starting from the right.

	Hundreds	Tens	Units	Point	tenths	
	1	**2**	**3**	**.**	**5**	
	2	**3**	**4**	**.**	**2**	+
Total	**3**	**5**	**7**	**.**	**7**	

Example 2 - Addition with different decimal places

234.8 + 147.96=382.76

In this example, we are adding a number that has one decimal place to a number that has two decimal places. Remember, it doesn't matter how many decimal places we are dealing with, or whether the numbers involved have a different number of decimal places. The most important part of the calculation is to *line up the decimal points*. If it helps you to line up the columns, you can write a zero in the hundredth's column of the first number, or you can leave that box empty.

	H	T	U	.	t	h	
	2	**3**	**4**	**.**	**8**	**0**	
	1	**4**	**7**	**.**	**9**	**6**	+
Total	**3**	**8**	**2**	**.**	**7**	**6**	

Example 3 – Subtraction

72.347 − 64.012= 8.335

Subtract in the same way as with whole numbers, but make sure the decimal place is in the right place.

	T	U	.	t	h	th	
	7	**2**	**.**	**3**	**4**	**7**	
	6	**4**	**.**	**0**	**1**	**2**	-
Total	**0**	**8**	**.**	**3**	**3**	**5**	

Multiplying Decimals

When multiplying and dividing decimals, the calculation works in the same way as with whole numbers. We multiply the numbers as if there was no decimal point at all. At the end of the calculation, we make sure that we have the decimal point in the correct place in our answer:

Starting with the answer that you have obtained by multiplying the numbers, move the decimal point the same number of places to the left as there are numbers after the decimal point in the two factors.

Example 1

0.5 x 0.5

5 x 5 is 25. There are two numbers after the decimal point, one in each of the multiplying numbers, so move the decimal point two places to the left, from 25, and **the answer is 0.25**

Example 2

1.2 x 0.25

First remove the decimal points **12 x 25 = 300**

This time, there are three digits after the decimal place in the multiplying numbers, one in 1.2 and two in 0.25. The decimal point in 300 is after the second zero, making it 300.0

Move the decimal point three places to the left, and **the answer is 0.3**

Dividing Decimals

Multiplying and dividing by 10

Multiplying a number by 10 moves the decimal point one place to the right. This increases the original number by a factor 10.

Dividing a number by 10 moves the decimal point to the left (decreasing the original number by a factor of 10.

Converting Between Fractions and Decimals

Converting from decimals to fractions is fairly straightforward. Any number can be expressed as a fraction by simply putting it over one**.**

For example:

$2 = {}^{2}/_{1}$ also, $21 = {}^{21}/_{1}$

The same rule applies to decimals.

Put the decimal over one, and then multiply both top and bottom by 10 until you no longer have a decimal point. Then, if possible, convert your fraction to a mixed number and/or reduce it down to its smallest form.

For example:

$0.25 = {}^{0.25}/_{1} = {}^{2.5}/_{10} = {}^{25}/_{100} = {}^{1}/_{4}$

$1.25 = {}^{1.25}/_{1} = {}^{12.5}/_{10} = {}^{125}/_{100} = {}^{5}/_{4} = 1{}^{1}/_{4}$

Converting from Fractions to Decimals

Converting from fractions to decimals is slightly harder, but gets easier once you realise that a fraction is actually a division calculation.

For example, one half, ${}^{1}/_{2}$, is actually 1 divided by 2, which is also the same as ${}^{5}/_{10}$, or five tenths, which is expressed as 0.5 in decimals This is because decimals are based on multiples of ten.

So, to convert a fraction to a decimal, consider the fraction as a division calculation, adding zeros after the decimal point if necessary, to complete it.

Example 1

${}^{2}/_{5} = 2.0 \div 5$

5 goes into 20 four times, and the decimal point goes in the same place in the top line.

The answer is therefore 0.4

NB:

- Decimals express tenths, hundredths, thousandths and beyond of units
- Treat them as any whole number but watch the position of the decimal point in your answer.

Fractions

Fractions just lie decimals are only numbers. They conform to rules even though the rules may seem slightly complicated for fractions, with the little practice they are relatively easy to understand.

- The numbers in a fraction are called the *numerator*, on the top, and the *denominator*, on the bottom. $^{\text{numerator}}/_{\text{denominator}}$
- ***Proper fractions*** have a numerator *smaller* than the denominator. Examples include $^{1}/_{2}$, $^{3}/_{4}$ and $^{7}/_{8}$.
- ***Improper fractions*** have a numerator *larger* than the denominator. Examples include $^{5}/_{4}$, $^{3}/_{2}$ and $^{101}/_{7}$.
- When working with fractions, they are always expressed as the *smallest possible set of (whole) numbers*. In other words, if the bottom number divides by the top number, divide it down (*reduce it*) until you can no longer do so.

Adding and Subtracting Fractions

The easiest fractions to add or subtract are those with the same denominator. You simply add or subtract the two numerators, and place them over the same denominator.

For example:

$^{3}/_{8} + ^{2}/_{8} = ^{5}/_{8}$

However, it's a bit more of a challenge when the two numbers don't share a common denominator.

In such cases, you need to find the **lowest common denominator**, or LCD. That is, the smallest number which divides by both denominators.

This may be straightforward; for example, if you are adding $^{1}/_{4}$ and $^{1}/_{2}$, then 4 divides by 2, and the lowest common denominator is therefore 4. So, $^{1}/_{4} + ^{2}/_{4} = ^{3}/_{4}$.

Sometimes it is not so easy to spot the lowest common denominator. The easiest way to do this, especially if the denominators are large, is usually to multiply the two denominators together and then reduce down if necessary.

Once you've found the lowest common denominator, then you have to multiply up the numerators to match.

Just as we reduced down the fractions in the previous section, now you have to multiply them up. As long as you always multiply or divide both top and bottom of a fraction by the same number, the **fraction remains the same**.

You therefore **multiply the numerator by whatever you multiplied the denominator by to get to the LCD**.

Example 1

$^{3}/_{5} + ^{1}/_{6}$

The smallest number that will divide by both denominators (5 and 6), is 30. When you multiply 5 by 6, you also have to multiply 3 by 6 to get $^{18}/_{30}$. You had to multiply 6 by 5, so you now have to multiply 1 by 5, to get $^{5}/_{30}$.

You now have a calculation that looks like this, where both of the denominators are the same:

$^{18}/_{30} + ^{5}/_{30}$

You can then add the two numerators together, 18 + 5 = 23.

The answer is therefore $^{23}/_{30}$.

Multiplying Fractions

When multiplying fractions, you write the two fractions side by side. Multiply the two numerators to find the numerator in your answer, and multiply the two denominators to find the denominator. Finally, reduce down the fraction to its simplest form.

Example 1

$^{3}/_{5} \times {}^{4}/_{7}$

Multiply the numerators (top numbers) $3 \times 4 = 12$ and the denominators $5 \times 7 = 35$.

The answer is therefore $^{12}/_{35}$

Example 2

$^{2}/_{5} \times {}^{5}/_{7}$

Again, multiply the numerators $2 \times 5 = 10$ and the denominators $5 \times 7 = 35$.

This gives the answer $^{10}/_{35}$

This time the fraction can be reduced as 10 and 35 are both divisible by 5.

The answer is therefore $^{2}/_{7}$

Dividing Fractions

To divide a fraction by another, turn the divisor fraction (the one that you are dividing by) upside down and then multiply (as above).

If this makes no sense, remember that multiplying by $^{1}/_{2}$ is the same as dividing by 2.

2 can be written as a fraction $^{2}/_{1}$, so all you have done is turned the fraction upside down.

Example

$^{3}/_{12} \div {}^{4}/_{7}$

First turn the divisor fraction upside down and change the calculation to a multiplication. The calculation therefore becomes $^{3}/_{12} \times {}^{7}/_{4}$

Multiply the numerators $3 \times 7 = 21$ and the denominators $12 \times 4 = 48$.

This gives the answer $^{21}/_{48}$

The fraction can be reduced as 21 and 48 are both divisible by 3.

The answer is therefore $^7/_{16}$

Exercise

1) What is three point zero two five multiplied by two hundred?

2) In Year 1 and 2 at Murang'a University there are 6 classes of 31 children and 2 classes of 32 children. How many children is this altogether?

3) 25 pupils at a secondary school are on average 5 minutes late arriving to school each day. How many hours and minutes of time is lost by this group of children per day?

4) On the last day of school, pupils were allowed to bring some snacks to share with each other. 5 pupils brought 3 apples each, 6 pupils brought 2 bananas each, and 3 pupils brought 4 nectarines each. How many pieces of fruit were there to share?

5) There are twenty-eight pupils in a class. Four-sevenths of the class are girls. A quarter of the girls have blue eyes. What fraction of the class are girls with blue eyes? Give your answer in its lowest terms.

6) 15 out of 120 Year 6 children receive additional time in their KS2 SATs exams. What fraction of the year group is this? Write your answer in its simplest form.

3.0 Ratios, Proportion and Percentages

3.1 Introduction

What is a Ratio?

Ratio is a mathematical term used for comparing the size of one part to another part. On the other hand, **Proportion** compares one part to the whole.

These mathematical concepts more are useful when:

- Converting between one currency and another when travelling abroad
- Measuring quantities in a recipe
- Comparing prices in the supermarket
- Using a scale, such as on a map or when making a model
- Working out food and drink you need for a party

You will usually see ratios used to compare two numbers, but they are often used to compare several quantities**.**

Ratios are usually shown as two or more numbers separated with a colon (:), for example, 7:5, 1:8 or 5:2:1

They are also often shown in a form similar to a fraction, e.g. 7/5 or 1/8

Sometimes they are simply expressed in words and numbers, such as ‘7 to 5’ or ‘one to eight’.

Reducing and Multiplying Ratios

Example 1:

Dave is ordering take-away lunches for himself and some friends. For every 4 packs of sandwiches he buys, he gets a free drink. If he buys 12 packs of sandwiches, how many free drinks does he get?

The ratio is four sandwiches to one drink, which is written 4:1

Dave buys 12 sandwiches, which is 3 lots of 4. To find out how many drinks he will get, you multiply both sides of the ratio by the same amount:

3 × 4 = 12 sandwiches

3 × 1 = 3 free drinks

Example 2:

James is sorting out the office stationery order. He has received 36 year planners and 3 free packs of marker pens. How many year planners were required to get one free pack of pens?

The ratio of planners to pens is 36:3

The ratio can be *reduced* or *simplified* by dividing both sides by a *common factor*. This is the same as the method used for simplifying fractions**.**

In this case, the ratio is reduced by dividing both sides of the ratio by three, giving the answer: **12:1**

1 pack of pens is received for every 12 planners ordered.

NB:

Unlike for fractions where both the numerator and denominator must be whole numbers, ratios can use decimal numbers.

Scaling Ratios

Ratios are especially useful when we need to *scale* an amount, i.e. increasing or decreasing a quantity or size of something.

The most common examples are maps or scale models, where areas of many kilometres in size are accurately represented on a small map, or a large steam locomotive, for example, is translated into much a smaller but precise representation of itself.

The ability to scale a ratio is also a very useful skill when increasing or decreasing the amount of ingredients in a recipe.

Ratios can be scaled up or down by multiplying both parts of the ratio by the same number, in the same way as in the examples above.

For example, a map scale of 1:25000 means that every 1mm on the map represents 25000mm (or 25m) on the ground.

A 1:12 scale model car means that every 1 inch on the model is equivalent to 12 inches on the full-size vehicle.

Example 3:

You need to make 20 cupcakes, but the quantity in the recipe below is only enough for 12. You could double the ingredients and make 24 cupcakes, having four left over for yourself! However, if you don’t have quite enough ingredients for 24, you can use ratio to calculate how much of each ingredient is needed to make 20 cupcakes.

120g butter
120g caster sugar
3 eggs
1 tsp vanilla extract
120g self-raising flour
1 tbsp milk

You need to scale the recipe from 12 to 20, so the scale ratio is **12:20**

However, the ratio isn’t in its simplest form, so you can reduce it to make the calculation easier. Both 12 and 20 can be divided equally by 2 or by 4. Dividing both sides by 4 will reduce the ratio to its simplest form: **3:5**

The next step requires some abstract thinking! You need to think of the original recipe as three units and the amount you need as 5 units.

The method for converting the recipe is therefore to divide all the original quantities by three, to give the amounts for 1 unit, then multiply by 5.

The amounts of butter, sugar and flour are all the same, so you only need to do one calculation for all of these:

120g ÷ 3 = 40g butter/sugar/flour
and
3 eggs ÷ 3 = 1 egg

In order to calculate the quantity of milk, first convert the units from tablespoons (tbsp) to millilitres (ml) to make it easier.

1tbsp milk = 15ml
15ml ÷ 3 = 5ml milk

One teaspoon (tsp) of vanilla extract is a bit tricky but, similarly, convert the units to millilitres: one teaspoon is equivalent to 5ml. You therefore end up with $^{5}/_{3}$ml of vanilla for this part of the calculation.

To calculate the quantities for 20 cupcakes, you need to multiply the quantities for ‘1 unit’ by 5.

40g × 5 = **200g butter/sugar/flour**
1 egg × 5 = **5 eggs**
5ml milk × 5 = **25ml milk**
$^{5}/_{3}$ml of vanilla × 5 = **8.33** ml vanilla (this will require a little bit of estimation when you are measuring! However, this is often the way in real life.)

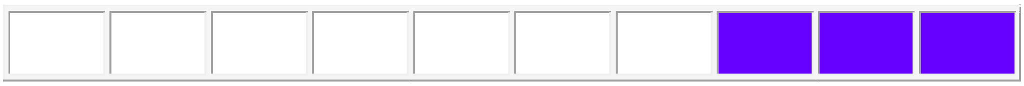
Proportion

Let’s look again at the white and purple boxes.

We now know that the ratio of purple to white is 3:7

However, the **fraction** of purple boxes is $^{3}/_{10}$

Proportion compares the part to the whole, in the same way as fractions. The proportion of purple boxes is therefore 3 in 10.



Even if you have multiple lines of boxes identical to the line above, no matter how many you have, the ratio of purple to white remains 3:7 and the proportion of purple to white remains 3 in every 10.

Example 4:

Kamau keeps tropical fish in an aquarium at home. She has 6 Tetra, 15 Minnow, 5 Platy and 4 Guppy.

What proportion of her fish are Minnow?

There are 30 fish in total and 15 of them are Minnow. So, the proportion of fish are that are Minnow is 15 in 30, which is the same as 1 in 2. Since proportion is related to fractions, you can say that one half of Kamau's fish are Minnow.

Similarly, 5 in 30 fish are Platy, which is the same as 1 in 6.

We can use this example to look at ratios as well.

The ratio of Minnow to other fish is 15:15, i.e. 1:1.

The ratio of Tetra to other fish is 6:24, i.e. 1:4

And the ratio of Tetra to Minnow to Platy to Guppy is 6:15:5:4!

4.0 Introduction to Percentages %

The term 'per cent' means 'out of a hundred'. In mathematics, percentages are used like fractions and decimals, as ways to describe parts of a whole. When you are using percentages, the whole is considered to be made up of a hundred equal parts. The symbol % is used to show that a number is a percentage, and less commonly the abbreviation 'pct' may be used.

Finding the Percentage

The general rule for finding a given percentage of a given whole is:

Work out the value of 1%, then multiply it by the percentage you need to find.

This is easiest to understand with an example. Let's suppose that you want to buy a new laptop computer. You have checked local suppliers and one company has offered to give you 20% off the list price of £500. How much will the laptop cost from that supplier?

In this example, the whole (Total cost) is £500, or the cost of the laptop before the discount is applied. The percentage that you need to find is 20%, or the discount offered by the supplier. You are then going to take that off the full price to find out what the laptop will cost you.

Start by working out the value of 1%

One percent of £500 is £500 ÷ 100 = £5.

Multiply it by the percentage you are looking for

Once you have worked out the value of 1%, you simply multiply it by the percentage you are looking for, in this case 20%.

£5 × 20 = £100.

You now know that the discount is worth £100.

Percentages as Decimals and Fractions

One percent is one hundredth of a whole. It can therefore be written as both a decimal and a fraction.

To write a percentage as a decimal, simply divide it by 100.

For example, 50% becomes 0.5, 20% becomes 0.2, 1% becomes 0.01 and so on.

We can calculate percentages using this knowledge. 50% is the same as a half, so 50% of 10 is 5, because five is half of 10 (10 ÷ 2). The decimal of 50% is 0.5. So another way of finding 50% of 10 is to say 10 × 0.5, or 10 halves.

20% of 50 is the same as saying 50 × 0.2, which equals 10.

17.5% of 380 = 380 × 0.175, which equals 66.5.

George’s salary increase above was 5% of £24,000. £24,000 × 0.05 = £1,200.

The conversion from decimal to percentage is simply the reverse calculation: multiply your decimal by 100.

0.5 = 50%
0.875 = 87.5%

To write a percentage as a fraction, put the percentage value over a denominator of 100, and divide it down into its lowest possible form.

50% = 50/100 = 5/10 = ½
20% = 20/100 = 2/10 = 1/5
30% = 30/100 = 3/10

Working out Percentages of a Whole

So far, we have looked at the basics of percentages, and how to add or subtract a percentage from a whole.

Sometimes it is useful to be able to work out the percentages of a whole when you are given the numbers concerned.

For example, let’s suppose that an organisation employs 9 managers, 12 administrators, 5 accountants, 3 human resource professionals, 7 cleaners and 4 catering staff. What percentage of each type of staff does it employ?

Start by working out the whole.

In this case, you do not know the ‘whole’, or the total number of staff in the organisation. The first step is therefore to add together the different types of staff.

9 managers + 12 administrators + 5 accountants + 3 HR professionals + 7 cleaners + 4 catering staff = 40 members of staff.

Work out the proportion (or fraction) of staff in each category.

We know the number of staff in each category, but we need to convert that to a fraction of the whole, expressed as a decimal. The calculation we need to do is:

Staff in Category ÷ Whole

We can use managers as an example:

9 managers ÷ 40 = 0.225

Convert the fraction of the whole into a percentage

0.225 is the fraction of staff that are managers, expressed as a decimal. To convert this number to a percentage, we need to multiply it by 100. Multiplying by 100 is the same as dividing by a hundred except you move the numbers the other way on the place values scale. So, 0.225 becomes 22.5.

In other words, 22.5% of the organisation's employees are managers.

We then do the same two calculations for each other category.

12 administrators ÷ 40 = 0.3. 0.3 × 100 = 30%.

5 accountants ÷ 40 = 0.125. 0.125 × 100 = 12.5%.

3 HR professionals ÷ 40 = 0.075. 0.075 × 100 = 7.5%.

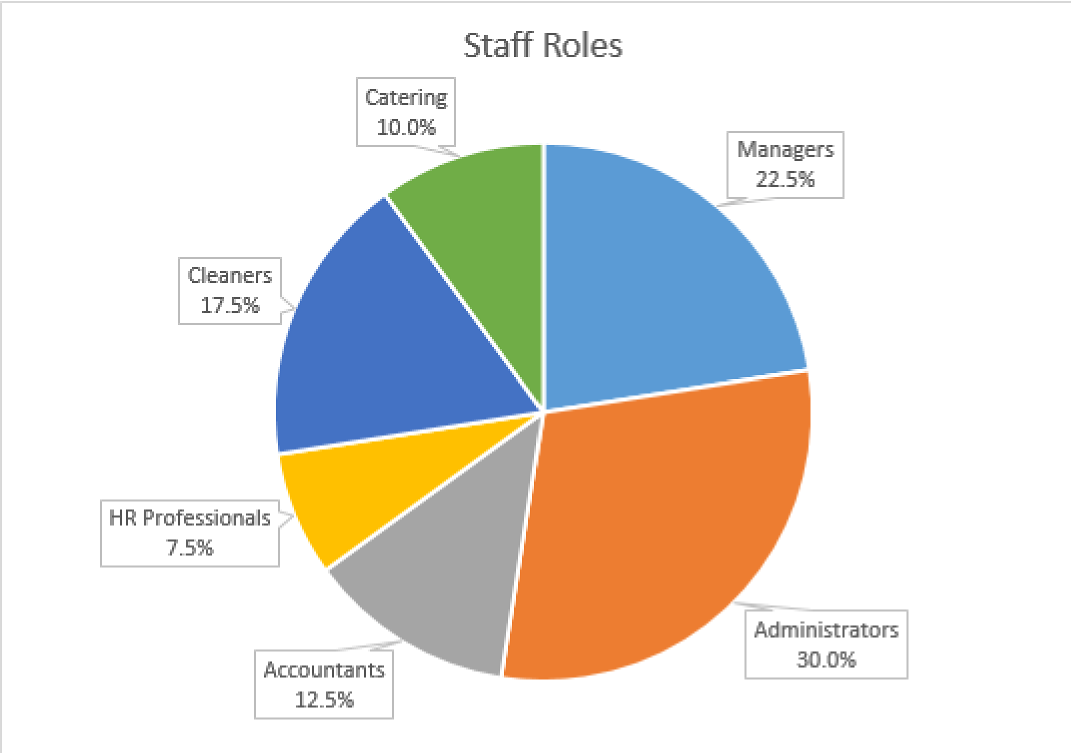
7 cleaners ÷ 40 = 0.175. 0.175 × 100 = 17.5%.

4 catering staff ÷ 40 = 0.1. 0.1 × 100 = 10%.

In summary, we can say that the organisation is made up of:

Roles	Number of Staff	% of Staff
Managers	9	22.5%
Administrators	12	30%
Accountants	5	12.5%
HR professionals	3	7.5%
Cleaners	7	17.5%
Catering staff	4	10%
Total	40	100%

It can be useful to show percentage data representing a whole on a pie chart. You can quickly see the proportions of categories of staff in the example.


Staff Roles
Catering 10.0%
Managers 22.5%
Cleaners 17.5%
HR Professionals 7.5%
Administrators 30.0%
Accountants 12.5%