Mathematical Literacy

CLASS TEXT & STUDY GUIDE

GRADE

11

CAPS

Susan Nicol, *et al.*

3-in-1

THE ANSWER SERIES *Your Key to Exam Success*

Grade 11 Maths Literacy 3-in-1 CAPS

CLASS TEXT & STUDY GUIDE

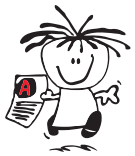
This Grade 11 Maths Literacy 3-in-1 study guide provides a solid transition between the grounding concepts covered in Grade 10 Maths Literacy and the skills required for the final Grade 12 exams.

This comprehensive, logically organised study guide accompanies you through an extensive range of exercises and memorable pointers, as you acquire the skills to tackle real-life mathematical problems within the framework of the CAPS curriculum.

Key features:

- Easy-to-understand, step-by-step approach
- Comprehensive notes and worked examples for all 7 topics
- Exercises and 'Test your Understandings' for each topic
- Detailed answers with explanations and handy hints

This study guide is filled with content, application and self-assessment. It is ideal for both home and classroom use.



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THIS CLASS TEXT & STUDY GUIDE INCLUDES

1. Notes and Worked Examples
2. Questions per Topic
3. Detailed Answers

E-book available

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CONTENTS

BY SUBSTITUTION Substitute the values into the given formula and solve for the unknown.

$\therefore$ Number of washers $\times$ time taken = 12

$6 \times \mathbf{Y} = 12$

$\mathbf{Y} = 12 \div 6$

$\mathbf{Y} = 2$ hours

❹ Drawing graphs from tables

The graph of an indirect/inverse proportion relationship is a **decreasing curved line** (known as a **hyperbolic curve** in mathematical terms).

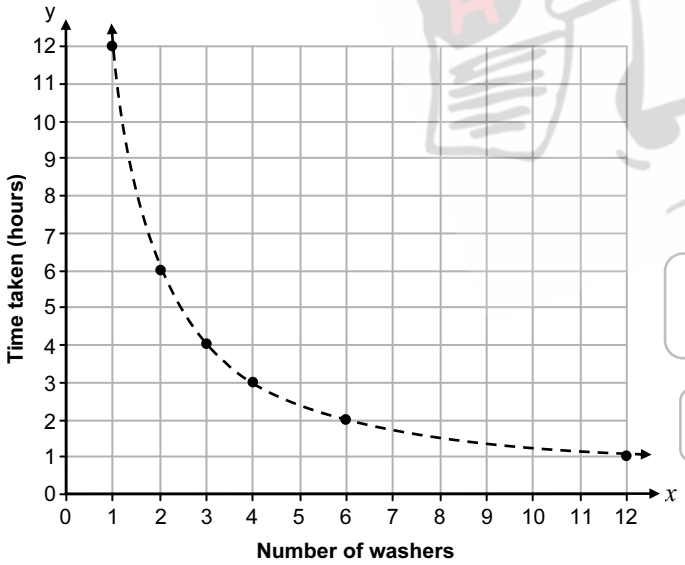
In the example of the time taken to valet a freight truck, the following graph can be drawn, based on the information in the table below:

Number of washers	1	2	3	4	6	12
Time taken (hours)	12	6	4	3	2	1

The following points will be plotted:

(1; 12) ; (2; 6) ; (3; 4) ; (4; 3) ; (6; 2) ; (12; 1)

TIME TAKEN TO VALET A FREIGHT TRUCK



NOTE!
Neither sets of variables will ever contain a zero. Therefore, this graph will not intersect the x- nor y-axis.

Note the decreasing curved line (hyperbolic curve)

Data is discrete ∴ a dotted line

EXAMPLE 2 **of an indirect/inverse proportion relationship:**

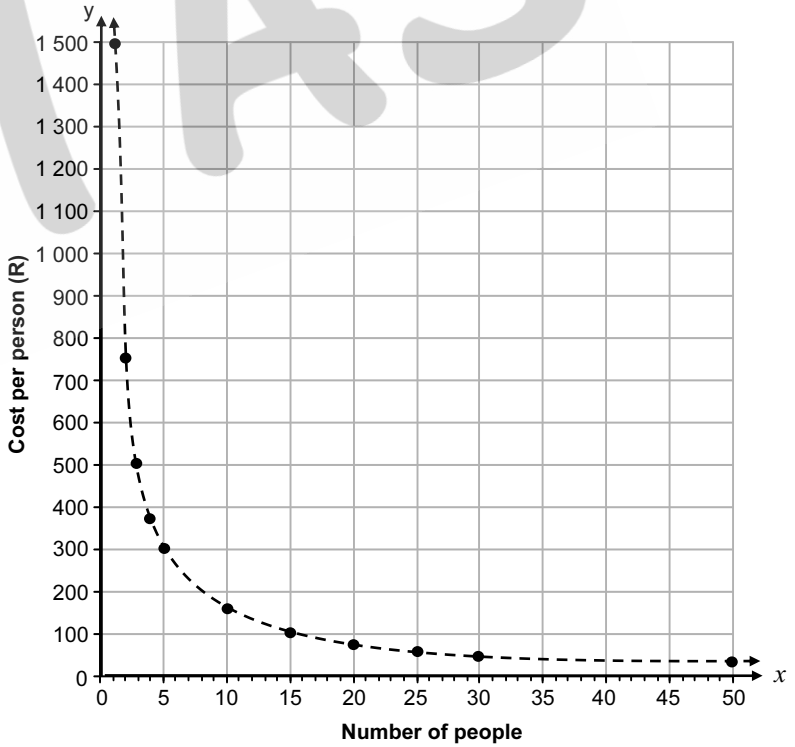
Miranda and her large, extended family love spit braais, but they are expensive for just one person to hire. Therefore, her family agrees to contribute to the cost of hiring the spit braai, which costs R1 500.

❺ Determining the type of relationship from a graph

An indirect/inverse proportion graph will be a decreasing curved line (hyperbolic curve) that will not intersect the x- nor y-axis. A constant product will always exist between the independent and dependent variables.

In the example of Miranda and her family hiring the spit braai, the following graph would be given:

COST PER PERSON OF HIRING THE SPIT BRAAI



Therefore, since this graph is a hyperbolic curve with a constant product of R1 500, this graph represents an **indirect/inverse proportion relationship**.

3. 7 hours to minutes

7 h × 60
= 420 min

hours —(× 60)→ *minutes*
big to small ∴ ***multiply***

4. 500 seconds to minutes and seconds

500 s ÷ 60
= 8 min + 0,33̇ min
= 8 min + (0,33̇ min × 60 s)
= 8 min + 20 s

To convert a fraction of time, multiply by maximum number of smaller units in the whole ∴ 60 s = 1 min

5. 203 hours to days and hours

203 h ÷ 24
= 8 days + 0,4583 days
= 8 days + (0,4583 days × 24 h)
= 8 days + 11 h

Only round off your final answer.

6. 1 911 days to years, weeks and days

1 911 days ÷ 365
= 5 years + 0,2356 years
= 5 years + (0,2356 years × 365)
= 5 years + 86 days
= 5 years + 86 days ÷ 7
= 5 years + 12 weeks + 0,2857 weeks
= 5 years + 12 weeks + (0,2857 weeks × 7 days)
= 5 years + 12 weeks + 2 days

1 year = 365 days
1 week = 7 days

EXERCISE 1

Answers on page A21

Convert the following:

1. 4 hours to minutes
2. 24 minutes to hours
3. 720 seconds to minutes
4. 10 days to hours
5. 35 weeks to days
6. 1 000 minutes to hours and minutes
7. 3 333 seconds to minutes and seconds
8. 10 975 days to years, weeks and days

Working with Time in Context

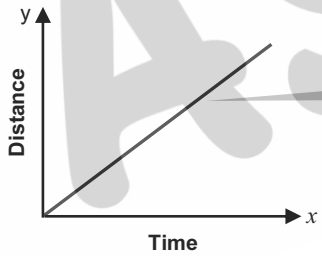
- Always make sure that you are working in the same units of time - often it is easiest to convert to the smallest unit of time.
- When working with elapsed time, subtract the second time recording from the first time recording - you may need to 'borrow' units from a bigger time unit.
- **Speed**: the rate at which a person or object covers a distance in a specified period of time.

$$\therefore \textbf{Average Speed} = \frac{\textbf{distance}}{\textbf{time}}$$

D / S T

  - The graph of speed is drawn when distance is plotted over time, where the steeper the gradient of the straight line, the greater the speed.

i.e.



Gradient represents speed

- **Calendars and Timetables** are a useful way to tabulate time and specific events in time e.g. a study timetable and a school calendar.
  - Be sure to read the keys carefully when interpreting calendars and timetables.

Worked Examples

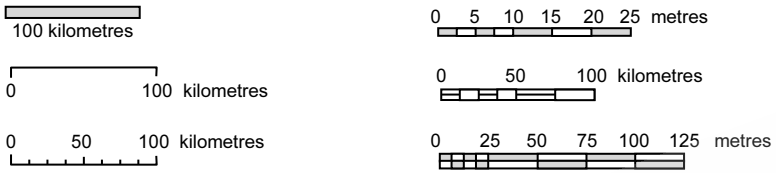
1. How much time has elapsed from 3.15 am to 6.40 pm?

3 am → 6 pm : 15 hours
0:15 → 0:40 : 25 minutes
∴ 15 hours and 25 minutes

Convert to the same time format!

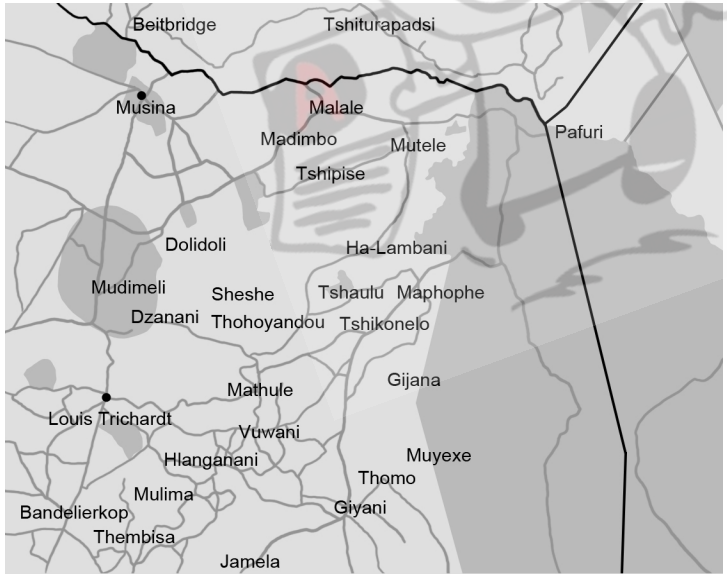
Bar Scales

- Bar scales are also known as **linear scales**.
- Examples of bar scales:



- By measuring the map distance between two points and comparing this distance with the bar scale of the map, you are able to work out the distance between the two points in reality.
- In contrast to a number (numerical) scale, where no units are included, the units are a very important part of a bar scale. This is because the bar scale shows a very specific relationship between the measured length of the lines or segments on the bar scale and actual length.

e.g. Kallie is a tractor salesman and often travels between the farmers of Louis Trichardt and Musina. Use the map and bar scale to determine the distance, 'as the crow flies', that Kallie travels between the two towns. Give your answer in km.



STEP 1 Use your ruler to accurately measure the length of the bar scale.

2 cm on the map represents 40 km in reality.

STEP 2 Write the bar scale measurements in the form of a numerical scale; i.e. 1 : . . . .

2 cm : 40 km

2 cm : 4 000 000 cm

Convert into the smallest unit, i.e. cm
× 1 000 × 100
∴ km m cm

Divide both sides by the number on the left to get the ratio 1 : . . . .

$\frac{2}{2} : \frac{4\,000\,000}{2}$

1 : 2 000 000

Once both measurements are in the same units, we drop the units and only work with the ratio numbers.

STEP 3 Use your ruler to accurately measure the distance between Louis Trichardt and Musina.

4 cm on the map

STEP 4 Use the numerical scale (from Step 2) and the distance between the two points on the map (from Step 3); to calculate the actual distance.

Actual distance = map distance × scale factor
= 4 cm × 2 000 000
= 8 000 000 cm
= 80 km

km m cm
÷ 1 000 ÷ 100

Check that the units are the same in your answer and the question.

Factors that Affect the Impression Created by a Graph

- The way in which a graph is drawn alters the impression of the data being represented.
- The following factors affect the impression created by a graph:

❶ **Scale of the axes**

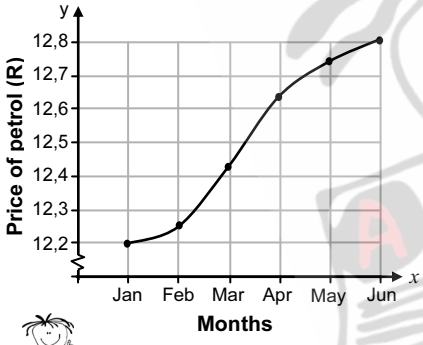
- the more spread out the axes, the larger the changes appear.

❷ **Point at which the axes cross**

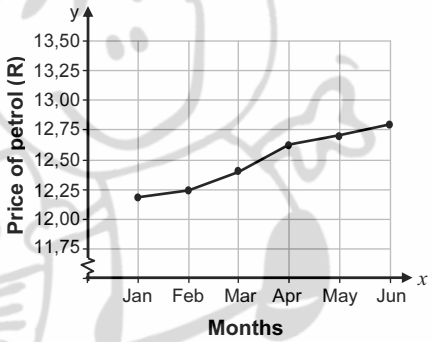
- by excluding the section of the axis where no points appear (i.e. breaking the axis), it 'zooms in' on the relevant data points.
- this alters the impression of the graph by highlighting small changes.

e.g.

GRAPH A
PRICE OF PETROL OVER 6 MONTHS



GRAPH B
PRICE OF PETROL OVER 6 MONTHS



GRAPH A

- ***Y-axis scale:*** *increments of 0,1.*
  ∴ the axis is more spread out than Graph B.
- *There is a break in the y-axis (≷) so the graph starts at 12,20. It 'zooms in' on the data values.*

This creates an impression that the petrol price has increased substantially over 6 months, as the minor/small changes in the price are highlighted.

GRAPH B

- ***Y-axis scale:*** *increments of 0,25.*
  ∴ the axis is more clustered together than Graph A.
- *There is a break in the y-axis (≷), but it ranges from 11,75 to 13,5. It 'zooms out' on the relevant data values.*

This creates the impression that the petrol price has only risen slightly over the last six months, as the small changes are not highlighted.

Test Your Understanding

Answers on page A34

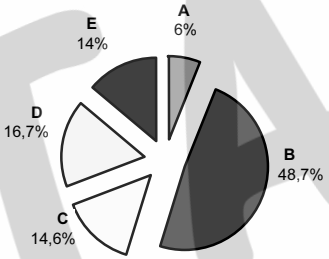
1. According to data published by Crime Stats SA:

   56 616 motor vehicles were stolen in South Africa during 2014.

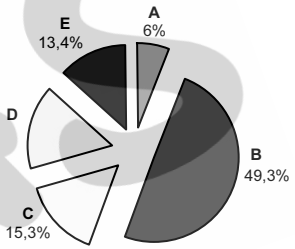
   55 090 motor vehicles were stolen in South Africa during 2015.

   The four provinces with the largest number of motor vehicle thefts were the Eastern Cape, Gauteng, KwaZulu-Natal and the Western Cape. This information is illustrated in the pie charts below:

MOTOR VEHICLES STOLEN IN SOUTH AFRICA IN 2014



MOTOR VEHICLES STOLEN IN SOUTH AFRICA IN 2015



KEY

A	Eastern Cape
B	Gauteng
C	KwaZulu-Natal
D	Western Cape
E	Other Provinces

[Source: www.crimestatssa.com]

Use the pie charts to answer the following questions:

1.1 In which province was the same percentage of motor vehicles stolen during both periods?

1.2 Determine the percentage of motor vehicles stolen in the Western Cape during 2015.

1.3 Which province showed the largest percentage increase in motor vehicles stolen from 2014 to 2015?

1.4 Calculate the percentage increase in motor vehicles stolen in Gauteng from 2014 to 2015.

1.5 Calculate the total number of vehicles that were stolen in KwaZulu-Natal during 2014. Give the answer rounded off to the nearest whole number.

1.6 Calculate the size of the sector of 'Other Provinces' in 2015.

A PROBABILITY SCALE

	Impossible		Equally likely / Even		Certain
Percentage:	0%	25%	50%	75%	100%
Fraction:	0	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	1
Decimal:	0,00	0,25	0,50	0,75	1,00
e.g.	Rolling a die and getting a '7'		Tossing a coin and getting 'heads' or 'tails'		Drawing a red or black card from a standard deck of cards

This is impossible, as a die only has the numbers from 1 - 6!

This is certain, as there are only red or black cards in a standard deck!

Worked Examples

Given the experiment of tossing a coin, answer the following questions:

1. Determine the possible outcomes of the experiment.

   Possible outcomes are 'heads' or 'tails'.

2. Describe the chance of the coin landing on 'legs'.

   The chance is described as 'impossible'.

   You can either get 'heads' or 'tails' - but no 'legs' exist!

3. Determine the probability of tossing 'heads'. Give your answer as a percentage, fraction and decimal.

   Probability of tossing 'heads' is equally likely.

   $\therefore$ *50%* ; $\frac{5}{10} = \frac{1}{2}$; *0,5*

Calculating Probability

- The universal symbol for calculating the probability of an event is **P(event)**.
- The formula used for calculating probability is:

$$\text{probability (event)} = \frac{\text{number of favourable outcomes}}{\text{total number of possible outcomes}}$$

Worked Examples

Given the experiment of rolling a die, calculate the probability of rolling:

1. a '3'.

   $P(3) = \frac{1}{6}$ *(= 0,17 = 16,67%)*

   NOTE! *Rather leave your answer as a simplified fraction to avoid any calculation errors in converting to decimals or percentages.*

2. an odd number.

   $P(\text{odd number}) = \frac{3}{6}$

   $= \frac{1}{2}$ *(= 0,5 = 50%)*

   Odd numbers = 1; 3; 5

3. an '8'.

   $P(8) = \frac{0}{6}$

   $= 0$ *(= 0 = 0%)*

   A die only has the numbers 1; 2; 3; 4; 5; 6.

4. a number from 1 to 6.

   $P(1; 2; 3; 4; 5; 6) = \frac{6}{6}$

   $= 1$ *(= 1,0 = 100%)*

   All these numbers are possible outcomes on a die.

2.1 1 dozen = 12 oranges = R9,00
∴ 1 orange = R9,00 ÷ 12 = R0,75

2.2 six oranges = $\frac{1}{2}$ dozen = R6,00
∴ 1 dozen = R6,00 × 2 = R12,00
∴ Profit = R12,00 - R9,00 = R3,00

2.3 Number of dozen oranges = 108 ÷ 12 = 9
∴ Cost of 9 dozen = 9 × R9,00 = R81,00

3. **METHOD 1** **Inverse × OR ÷ operations**

tilers : hours
× 3 (6 : 120) ÷ 3
(? : 40)

∴ Number of tilers = 6 × 3 = 18

OR

METHOD 2 **Table with constant product**

Tilers	6	?
Hours	120	40

? × 40 = 720

6 × 120 = 720

∴ Number of tilers = 720 ÷ 40 = 18

4.1 Daily earnings = 8,5 h × R12,50 = R106,25

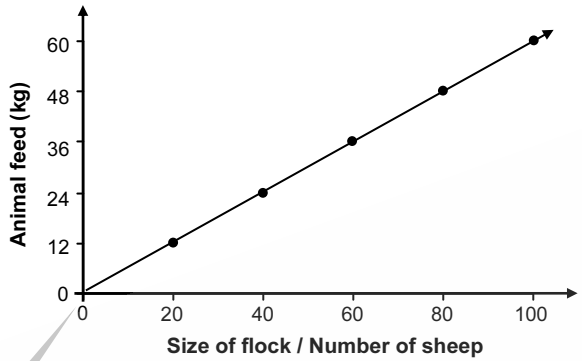
4.2 Number of hours worked = R218,75 ÷ R12,50
= 17,5 h

5.1

Amount of animal feed (kg)	12	24	36	48	60
Size of flock / No. of sheep	20	40	60	80	100

Notice the constant ratio of $\frac{20}{12} = \frac{40}{24} = \frac{60}{36} = 1,67$

5.2 **AMOUNT OF ANIMAL FEED NEEDED**



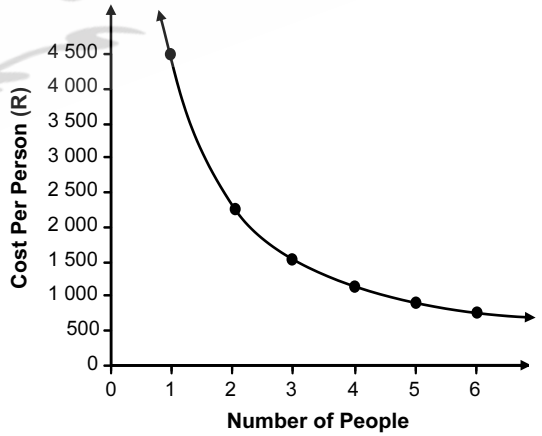
REMEMBER!
Extend the straight line to the origin!

6.1

Number of people	1	2	3	4	5	6
Cost per person (R)	4 500	2 250	1 500	1 125	900	750

Notice the constant product of
1 × 4 500 = 2 × 2 250 = 3 × 1 500 = 4 500

6.2 **COST PER PERSON TO HIRE THE LIMOUSINE**



UNIT 6:
Rates

1. R149,99 ÷ 24 = R6,25

2. R82,80 ÷ 12 = R6,90

3. Speed = $\frac{\text{distance}}{\text{time}}$
= $\frac{21,1 \text{ km}}{2 \text{ h}}$
= 10,55 km/h

4. Unit rate = 75 mℓ × 2
= 150 mℓ per kg meat

Since 0,5 kg given, determine the unit rate of 1 kg.
∴ 0,5 kg × 2 = 1 kg

∴ Yoghurt needed for 3,7 kg = 3,7 kg × 150 mℓ
= 555 mℓ

5. Dozen eggs: $\frac{\text{R23,99}}{\text{12 eggs}}$ = R1,999/egg

18 eggs: $\frac{\text{R34,29}}{\text{18 eggs}}$ = R1,905/egg

∴ 18 eggs is cheaper

6. Time = $\frac{\text{distance}}{\text{speed}}$
= $\frac{128 \text{ km}}{95 \text{ km/h}}$
= 1,35 hours (1 hour 21 minutes)

7. Unit rate = $\frac{\text{R1 350}}{\text{1 054 kW}}$ = R1,28/kW

∴ Cost of 750 kW = R1,28 × 750 kW
= R960

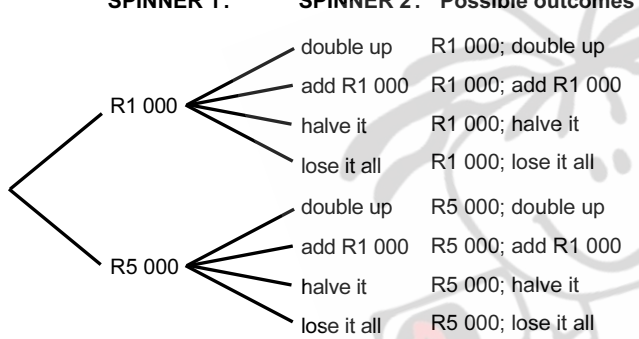
3.3 Experimental probability $= \frac{145}{150} = 96{,}67\%$

3.4 Yes, the drug test is reliable as the theoretical and experimental probabilities are very, very close.

UNIT 3:
Representations for determining possible outcomes

Test Your Understanding

1.1



1.2.1 8 possible outcomes

1.2.2 P(R5 000 for spinner 1 only) $= \frac{1}{2}$ $(= 0{,}5 = 50\%)$

1.2.3 P(R1 000; halve it) $= \frac{1}{8}$ $(= 0{,}125 = 12{,}5\%)$

1.3.1

Possible outcomes	Rand value
R1 000; double up	R1 000 × 2 = R2 000
R1 000; add R1 000	R1 000 + R1 000 = R2 000
R1 000; halve it	R1 000 ÷ 2 = R500
R1 000; lose it all	R1 000 - R1 000 = R0
R5 000; double it	R5 000 × 2 = R10 000
R5 000; add R1 000	R5 000 + R1 000 = R6 000
R5 000; halve it	R5 000 ÷ 2 = R2 500
R5 000; lose it all	R5 000 - R5 000 = R0

1.3.2 (a) P(R10 000) $= \frac{1}{8}$ $(= 0{,}125 = 12{,}5\%)$

(b) P(R2 000) $= \frac{2}{8} = \frac{1}{4}$ $(= 0{,}25 = 25\%)$

(c) P(R0) $= \frac{2}{8} = \frac{1}{4}$ $(= 0{,}25 = 25\%)$

2.1 38 learners 2.2 32 girls

2.3 43 boys in Grade 11 2.4 88 learners in Grade 11

2.5.1 P(girl) $= \frac{45}{88}$ $(= 0{,}511 = 51{,}14\%)$

2.5.2 P(Core Maths) $= \frac{38}{88} = \frac{19}{44}$ $(= 0{,}4318 = 43{,}18\%)$

2.5.3 P(girl taking Maths Lit) $= \frac{32}{88}$

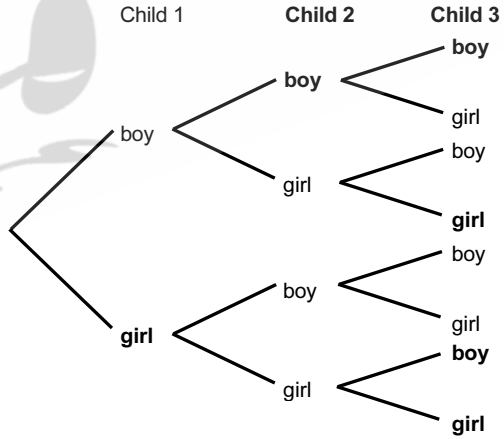
$= \frac{4}{11}$ $(= 0{,}3636 = 36{,}36\%)$

2.5.4 P(not Maths Lit) = P(Maths) $= \frac{38}{88}$

$= \frac{19}{44}$

$(= 0{,}4318 = 43{,}18\%)$

3.1



3.2 Possible outcomes:

(boy; boy; boy) (boy; boy; girl) (boy; girl; boy)
(boy; girl; girl) (girl; boy; boy) (girl; boy; girl)
(girl; girl; boy) (girl; girl; girl)

3.3.1 P(boy) $= \frac{1}{2}$ $(= 0{,}5 = 50\%)$

3.3.2 P(boy for 2nd child) $= \frac{1}{2}$ $(= 0{,}5 = 50\%)$

3.3.3 P(3 boys) $= \frac{1}{8}$ $(= 0{,}125 = 12{,}5\%)$

3.3.4 P(1 boy and 2 girls) $= \frac{3}{8}$ $(= 0{,}375 = 37{,}5\%)$

NOTE! *This means **any order** of 1 boy and 2 girls*
∴ Possible outcomes = (boy; girl; girl)
OR (girl; boy; girl) OR (girl; girl; boy) = 3

3.3.5 P(first boy, then 2 girls) $= \frac{1}{8}$ $(= 0{,}125 - 12{,}5\%)$

NOTE! *Order is specified here, so only 1 possible outcome.*

4.1

		Would buy this flavour of coffee	Would not buy this flavour of coffee	Total
Gender	Male	27	23	**50**
	Female	21	**29**	**50**
	Total	**48**	52	**100**

4.2 100 people

4.3 P(would buy the coffee) $= \frac{48}{100}$ $(= 0{,}48 = 48\%)$

4.4 P(male who would not buy the coffee)

$= \frac{23}{100}$ $(= 0{,}23 = 23\%)$

4.5 P(would buy the coffee) $= \frac{48}{100} \times 100\% = 48\%$

Number of people who might buy the coffee

$= 48\% \times 30 = \frac{48}{100} \times \frac{30}{1} = 14{,}4 \approx 14$ people

4.6 No. More than 50% $\left(\frac{52}{100}\right)$ of the people who tried the coffee responded that they would not buy the coffee.