PATHWAYS TO SUCCESS

COGNITIVE SKILLS

ADVANCED

SECOND EDITION

MIGHTY MINDS

Steven McCabe
& the Mighty Minds team

WELCOME TO PATHWAYS TO SUCCESS: COGNITIVE SKILLS (ADVANCED)

Mighty Minds is an educational consultancy that specialises in assisting students to develop their thinking and problem-solving skills. The success of Mighty Minds is reflected in the achievements of the tens of thousands of students and the hundreds of schools Australia-wide that utilise the services of Mighty Minds each year.

In response to client feedback, which has highlighted the need for students to develop strategies to solve problems in unfamiliar situations, Mighty Minds has produced ***Pathways to Success: Cognitive Skills***. As well as meeting those needs, this workbook also includes work on essential examination skills, making it a highly desirable resource for all senior students.

Pathways to Success: Cognitive Skills is:

- a valuable resource for educators, providing them with a cost-effective timesaving tool that features proven, educationally sound activities and techniques;
- an interactive step-by-step student guide specifically created for senior students, irrespective of their intended pathway. It has been designed to improve the effective learning skills of all senior students, showing them how to invest in themselves by using strategies that will be invaluable for life.

SECTION 01

Section one asks students to reflect on their present position in life and to consider which possible pathway might lead to a successful career. These activities have been designed to stimulate the brain while still making learning an enjoyable experience. The overall aim of this section is to encourage each student to consider employing active and productive learning methods rather than passive and ineffective techniques.

SECTION 02

Section two focuses on fundamental learning and higher-order thinking abilities. It is obvious that to be successful in any senior curriculum, a student must have a solid foundation in the basic skills that underpin literacy, visual literacy and numeracy. Further, to achieve more than a sound level of achievement, a student must demonstrate higher-order thinking skills. To facilitate this process, we have included a section that demonstrates (with worked examples) various methods for problem-solving and how they can be applied in a variety of situations.

SECTION 03

Section three has a specific focus on the Cognitive Skills (CSs). All 75 CSs are provided with definitions and marking criteria to clearly explain the skill and what is required at each level of achievement. These CSs are accompanied by questions from a variety of subjects to allow students to apply their knowledge across a wide range of curriculum areas.

How to use this book

Pathways to Success: Cognitive Skills (Advanced) is designed to promote active learning, so students are encouraged to show their working in the spaces provided.

Equipment, including coloured pencils, pens, a calculator and an eraser will be required to complete tasks and activities.

Answers are given at the back of the workbook.

CONTENTS

SECTION 01

SECTION 02

SECTION 03

SECTION 01

DESIRING SUCCESS

The right attitude

How do we achieve the success that we desire?

Perhaps we can gain some insight into this question by looking at the philosophies of those who have achieved considerable success.

> "Always bear in mind that your own resolution to succeed is more important than any other one thing."—ABRAHAM LINCOLN

> "Being confident and believing in your own self-worth is necessary to achieving your potential."—SHERYL SANDBERG, CHIEF OPERATING OFFICER OF FACEBOOK

As with most successful people, Lincoln and Sandberg had no doubt that the most important factors in achieving success (or otherwise) are a person's belief in themself and their determination to succeed.

What is true in life is also true in education; our success is largely determined by our attitude and behaviour. If you believe you can succeed and you view your schoolwork as being important to achieving success, you will be much more likely to succeed.

From our experience, it is true that:

> "Your thoughts lead to your actions; your actions form your habits; your habits become your behaviour; and, in turn, your behaviour determines your destiny."—MIGHTY MINDS

Many students fall into the bad habit of studying late at night, even though it has been proven that working late reduces students' ability to concentrate in class the next day.

Furthermore, many students study in their bedroom. However, bedrooms contain a lot of distractions (for example, your computer, social media, music, TV, stereo, great posters, fantastic views out the window). Despite these distractions, many students convince themselves that by simply being there, they are putting in a big effort.

Now might be a good time to check your attitude.

This book will help you explore the many pathways to success, providing you with invaluable skills that will help you along the way; however, you will not move any closer to success until you truly desire it.

How to succeed in Senior

1. Set academic goals.
2. Have a strong, positive self-belief and attitude towards what you want to achieve.
3. Realise failure is often the first step to success.
4. See the benefits of working consistently each week.
5. Work collaboratively to reach your goals.
6. Form study groups both at school and online.
7. Be efficient; this includes time management and effective learning skills.
8. Understand the importance of the external examinations and their relevance to your ATAR.
9. Develop your problem-solving abilities so that higher academic performance can be achieved.
10. Construct a detailed plan for success, whether it be for an assignment, essay, examination, presentation or job interview.

Motivation

At the heart of success is motivation – the desire to achieve what you want. Motivation enables us to set out on the path to success and shows us the way forward. It is often far more important than talent, skill or ability.

Goals

Goals suggest what is possible. At the same time, they guide our actions in our pursuit of these possibilities.

TASK 1

What is your goal? What do you want to be doing in ten years, five years, at the end of this year? Think not only in terms of work but also in terms of personal goals. Do you want to be in a relationship? Do you want to be travelling? Where do you want to be living? What do you want to be doing? How strong is your motivation to achieve your goals? How much would you be willing to sacrifice to achieve them?

Decide what you want from your senior school years. Start with a list of everything that is important to you. The list does not have to be in any particular order; just write ideas down as you think of them.

SECTION 02

FUNDAMENTAL LEARNING – LITERACY

Senior students often overlook (or do not fully understand) some of the basic techniques that should be applied to every piece of writing they produce. The objective of this section is to revisit some of the skills you should already use to produce work that is fluent, error-free and well-presented. By mastering the key points presented in the following sections, you will produce work of a much higher quality.

It is important to carefully proofread any work you produce, paying attention to grammar, spelling, punctuation and word choice.

Proofreading and editing

One of the most useful skills to master is effective proofreading. We all make mistakes, particularly when we are drafting, but you should develop the habit of carefully checking for errors in any piece of work that you are presenting. Producing your best work should not just be a matter of personal pride. If you write with clarity and precision, producing error-free and well-presented work, you help the reader to understand what you are saying.

Use the following checklist as a start for editing your writing; remember to add and build on this list.

EDITING CHECKLIST

- Make sure it flows; use linking sentences and swap ideas and phrases around.
- New idea? New paragraph!
- Know the purpose, audience and genre of your written response.
- Vary the first word of each sentence.
- Vary the length of sentences.
- Aim for one impressive word every three lines.
- Replace any boring words.
- Check your verbs; remember that "a good verb is worth a dozen adjectives!"
- Make sure your use of tense is correct and consistent.
- Count your punctuation marks! Aim for seven or more of the 12 common punctuation marks – see page 12.
- Describe, using the five senses: sight, sound, smell, taste and touch.
- Add plenty of imagery, such as similes, metaphors and personification.

PUNCTUATION

FULL STOP

Marks the end of a sentence.

A full stop ends a sentence.

COMMA

Shows a break in sentence structure or separates items in a list.

I need to get home and feed my dog, my cat, my fish and my birds.

SEMICOLON

Used to connect independent clauses and indicates a closer relationship between the clauses than a full stop does.

Call me tomorrow; I will give you my answer then.

COLON

Used to precede a list of items or an expansion or explanation.

Bring these items on the camping trip: hiking boots, canned food, an umbrella and sleeping gear.

QUESTION MARK

Indicates a question.

What time did you want to meet for dinner?

HYPHEN

Joins words to indicate that they have a combined meaning or that they are linked in the grammar of a sentence.

The amount of user-generated content is tremendous.

APOSTROPHE

Used to indicate either possession or the omission of letters or numbers.

Pushing the car all that way can't be done.

PARENTHESES

Used to enclose words or figures so as to separate them from the context (also known as brackets).

Winston Churchill (prime minister of the United Kingdom during World War II) did his best to boost the country's morale.

EXCLAMATION MARK

Indicates an exclamation.

A tremendous quake shook the very ground beneath his feet!

QUOTATION MARKS

Used to show direct speech and the quoted work of other writers.

"Yes, that is the situation," she replied.

ELLIPSIS

Used to show omission of parts of a word or sentence.

Well, you know what they say, "When life gives you lemons ..."

DASH

Used to indicate a range in numbers or dates, or a break in a sentence or an interruption to speech.

August–September
"But you said —"
"I remember what I said!"

ACTIVITY 1 (CS: USE)

Use colons, semicolons, parentheses and hyphens to correctly punctuate the following:

We were having a fabulous day out. Darcy was in charge of the kids Fiona and I were enjoying a relaxing lunch Robert was keeping my parents company and Maria was walking the dogs. Everyone with the exception of Peter seemed to be enjoying themselves. Peter Darcy's friend was quiet and distracted and sat there bear like with his back up against a tree.

Later we were to find out why he had a bad dose of the flu. If only we had known, we could have helped him for among us we had all kinds of things to ease his condition warm clothes, hot drinks, aspirin and even cough syrup.

ACTIVITY 2 (CS: USE)

Use apostrophes to correctly punctuate the following text.

Its a shame the Cougars lost yesterday, for the teams place in the final is now in doubt.

I suppose theres no use suggesting whose fault it was. It seemed that the fullbacks missed tackle let in the winning try, but if the coach drops him whos he going to put in his place?

Really, the whole team needs to pick up its game if its to win next week. I mean, James kicking was astray; the two second-row forwards tackling was awful and the wingers couldnt run out of sight on a dark night.

They are nowhere near the team of 98. Wheres the spirit that that team showed when they came from behind to snatch victory from the oppositions grasp after the final siren? At 5 oclock that day, everyones cheering could be heard for kilometres around.

The supporters all feel let down and its going to be hard to get them back for next weeks game. I suspect that at 3 oclock next Saturday, most of the seats in the grandstand will be empty.

The players weren't the only ones to have a bad day though; even the referees performance was poor and the less said about both touch judges decisions, the better.

We can only hope that they all have better games next time.

FUNDAMENTAL LEARNING – NUMERACY

Using graphs to display data

Data is an integral part of mathematics, and it is used in many different avenues of life every day. Raw data can be difficult to interpret, however, and this is why we use graphs; they provide an accurate, easy-to-interpret visual representation, so that data can be quickly analysed.

When creating a graph, it is important to choose the most effective type to display the data for easy interpretation. The most common types of graphs are:

- **Histogram:** these are useful when we need to display numerical data in groups or class intervals and are particularly useful when displaying continuous data. For example, we could use a histogram to display the heights of students in a class.
- **Bar graph:** we use these to display categorical data. For example, we could graph the number of different breeds of dogs observed at a dog beach.
- **Pie chart:** we use this when comparing the proportion or percentages of a total made up by different categories. For example, we could use a pie chart to compare the percentage of water usage taken up by different activities in a house (shower, kitchen sink, washing machine, backyard sprinklers and so on).
- **Line graph:** we use these to track changes over a period of time. For example, we could graph the speed of a cyclist over time on a bike ride.

Remember to always include a heading and label your axes when you make your graph, as well as providing a legend if necessary.

ACTIVITY 11 (CS: DECIDE)

Decide which type of data display would be the most appropriate for the following data:

a) Results of a university cohort in their first-year anatomy class. A total of 3% of students scored a high distinction, 12% scored a distinction, 30% scored a credit, 46% scored a pass and the remainder failed.

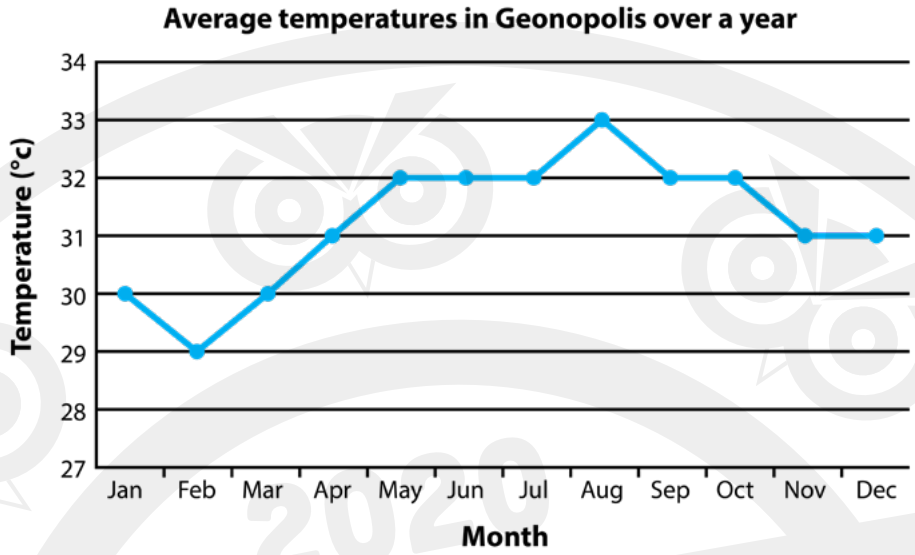
b) Information from a survey about types of pets owned by a class of students.

c) The weights (in kilograms) of members in a fitness group before going on a 30-day cleanse.

d) The distance Raymond had travelled, which was recorded at ten-minute time intervals on his three-hour run.

ACTIVITY 12 (CS: INTERPRET)

Interpret the following graph and answer the questions that follow.



a) In which month was the average temperature the highest? _____

b) What was the difference in average temperature between October and March?

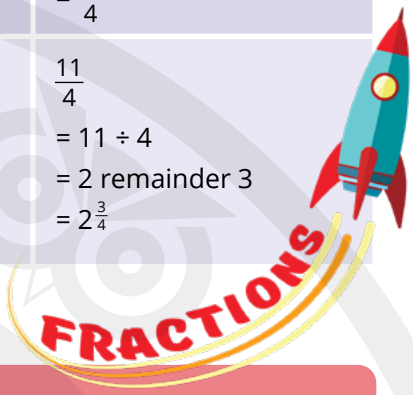
_____

c) What was the range of average temperatures over the year? _____

Fractions

Technique	Explanation	Example
Adding and subtracting	When adding or subtracting two fractions, both must have the same denominator. If not, the fractions must both be converted to have the same denominator, using equivalent fractions. Once the fractions have a common denominator, simply add or subtract the numerators.	$\frac{3}{4} + \frac{1}{6}$ $= \frac{3}{4} \times \frac{3}{3} + \frac{1}{6} \times \frac{2}{2}$ $= \frac{9}{12} + \frac{2}{12}$ $= \frac{11}{12}$
Multiplying	Multiply the numerators and denominators of each fraction.	$\frac{3}{4} \times \frac{1}{6}$ $= \frac{3}{24}$ $= \frac{1}{8}$
Dividing	Invert the second fraction and then multiply the fractions.	$\frac{3}{4} \div \frac{1}{6}$ $= \frac{3}{4} \times \frac{6}{1}$ $= \frac{18}{4}$ $= \frac{9}{2}$ (or $4\frac{1}{2}$)

Converting from a mixed number to an improper fraction	Multiply the whole number by the fraction's denominator, then add the numerator. Place this total over the original denominator.	$6\frac{3}{4}$ $= \frac{6}{1} \times \frac{4}{4} + \frac{3}{4}$ $= \frac{24}{4} + \frac{3}{4}$ $= \frac{27}{4}$
Converting from an improper fraction to a mixed number	Divide the numerator by the denominator. The result is the whole number, and the remainder is the numerator of the fractional part. This fraction has the same denominator as the original improper fraction.	$\frac{11}{4}$ $= 11 \div 4$ $= 2$ remainder 3 $= 2\frac{3}{4}$



ACTIVITY 13 (CS: CALCULATE)

Calculate (showing working):

a) $\frac{1}{5} + \frac{3}{5}$ b) $\frac{7}{5} - \frac{1}{5}$ c) $\frac{1}{2} \times \frac{2}{3}$ d) $\frac{4}{3} \div \frac{2}{5}$ e) $\frac{3}{8} + \frac{1}{6}$

ACTIVITY 14 (CS: CALCULATE)

Jerry and Katherine have four sons: Marcus, Arthur, Ashton and Trevor. Marcus has one child, Arthur has no children, Ashton has three children and Trevor has four children.

The whole family are celebrating Katherine's birthday and have just smashed a piñata full of lollies. The family have mutually agreed that Jerry and Katherine will receive half of the lollies for themselves, and the other half will be divided up among the rest of the family.

Marcus, Arthur and Ashton have each proposed a method to divide up their half of the lollies between the family:

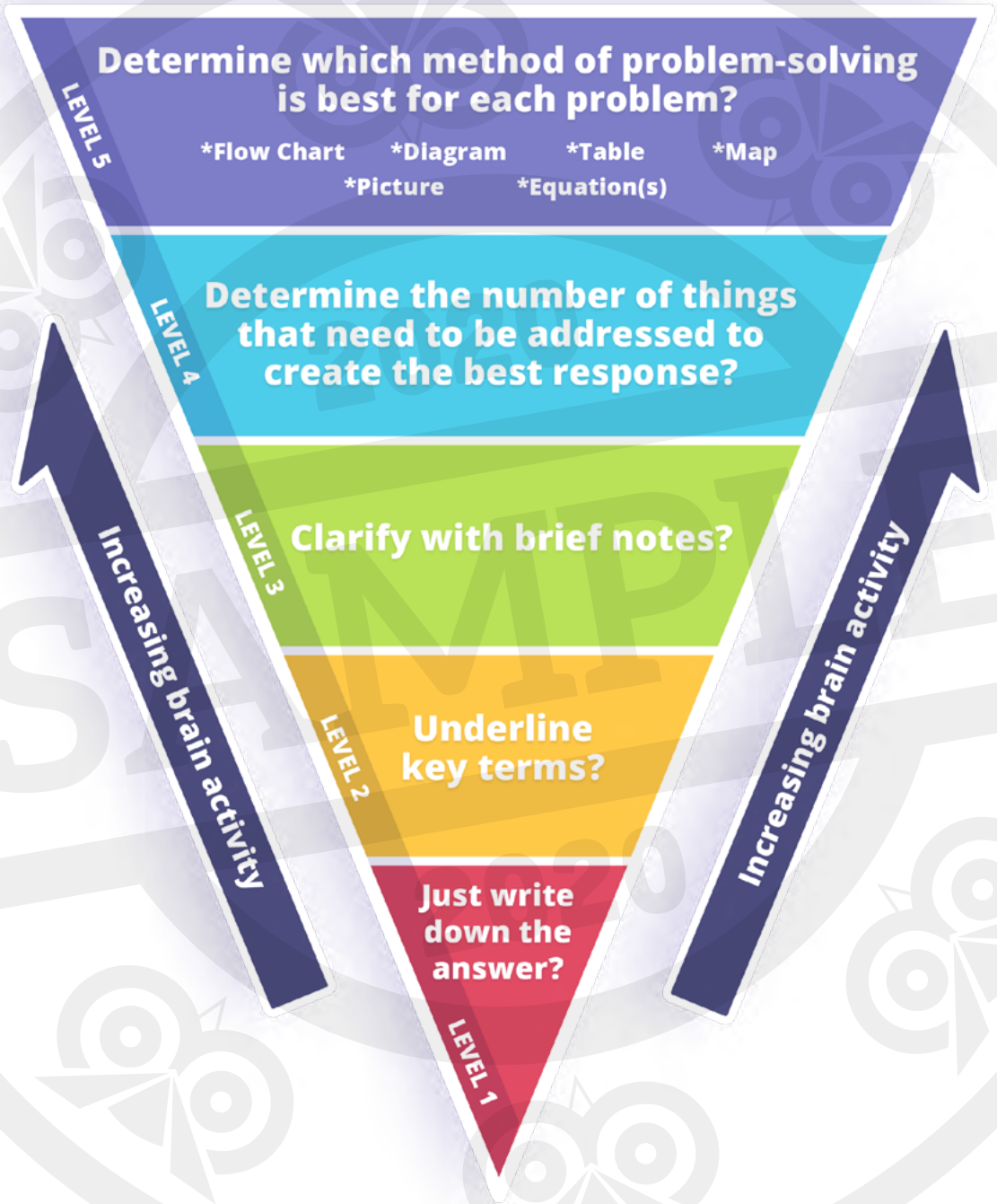
Marcus suggests that they divide their share equally between the four sons, and then each son divides that share evenly between themselves and their children.

Arthur proposes that their share is divided evenly between the four sons and all of the grandchildren.

Ashton thinks that half of their share should be divided evenly among the four sons, and the other half should be divided evenly among the grandchildren.

WHICH LEVEL OF PROBLEM-SOLVER ARE YOU?

WHEN YOU APPROACH PROBLEMS DO YOU ...



WHICH LEVEL ARE YOU? HOW CAN YOU IMPROVE?

Following are some ideas to help you move from the lower phases of problem-solving to being much more effective and confident when faced with more in-depth problems.

SECTION 03

COGNITIVE SKILLS

The Cognitive Skills (CSs) are the fundamental skills that you learn while at school; you've been learning them for years without even realising it! Each of the 75 CSs covers a different aspect of the assessable skills you will encounter during your senior studies. They are the words that are used in exam questions, your assignment tasks and the work you do in class. You will use similar Cognitive Skills across all of your subjects: from Maths, to Science, to English, to the Humanities and Physical Education.

To do well in assessments, it's important you understand the Cognitive Skills and what they mean. After all, it's impossible to answer an exam question if you don't know what it's asking.

"Analysing" means the same thing in History and Mathematics, but you will have to apply it to different types of information in different subjects. Therefore, understanding how to analyse is a valuable skill that will help you in every subject.

When answering an exam question, you should follow the approach below:

1. Read the question closely and highlight or underline important information and key words. For example, in a Maths question, this would be words such as "add" or "divide" and the relevant numbers. In an English question, this might be words such as "simile" or "metaphor", so you can identify exactly what you're looking for in the text.
2. Identify all Cognitive Skills in the question; sometimes there will be more than one. Circling or underlining the CS will remind you exactly what you're being asked to do.
3. Use your knowledge of the Cognitive Skill meanings and steps to formulate your method for answering the question. Following the steps will ensure that you answer the question thoroughly, cover everything that you need to and produce a high-level response.
4. Self-assess your response using the Cognitive Skill. Always read over your answer to check that you didn't miss anything and that you've understood the CS. Use the self-assessment matrix for the appropriate CSs to ensure you've done everything required.

HOW TO EFFECTIVELY ANSWER A COGNITIVE SKILL QUESTION

1. Deconstruct question: pull the question apart to understand what is being asked of you.
2. Identify CS/CSs: there may be more than one!
3. Formulate steps based on CS/CSs in the question: what do you need to do to answer the question?
4. Self-assess using levels: use the proficiency scales to assess what level you would achieve based on your response.

ANALYSE

DEFINITION:

Break down into key parts to understand how each part contributes to the whole.

REAL-WORLD APPLICATIONS:

The action of analysing is important to master. We analyse texts in English class, analyse the results of an experiment in Science class and analyse sources in History class.

PROFICIENCY SCALE:

Student's work has demonstrated their knowledge and understanding of **analysing**. Each level has the following characteristics:

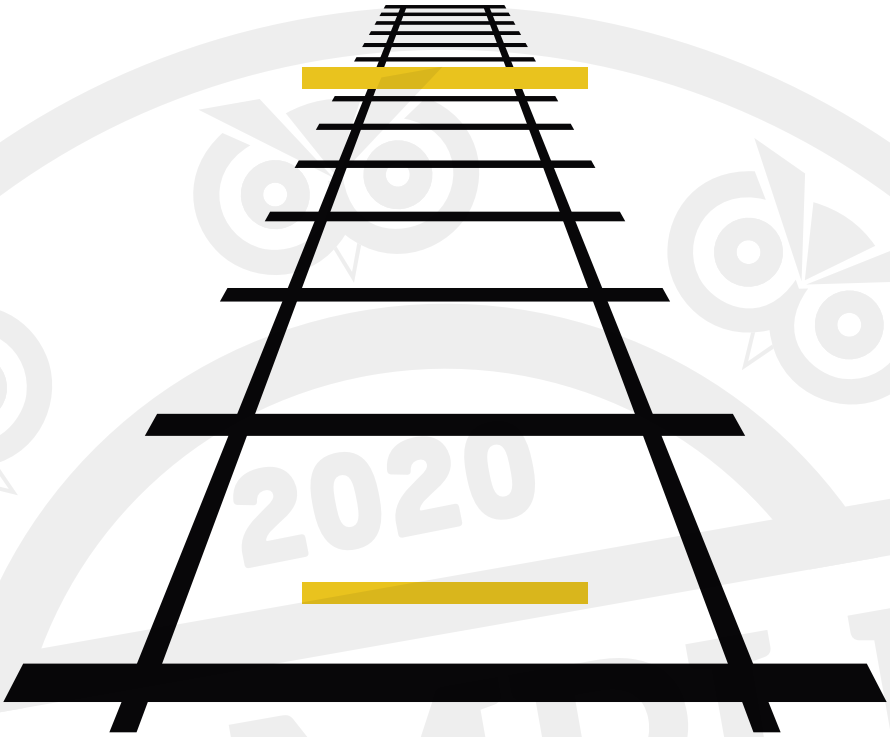
LEVEL 4 DESCRIPTION	LEVEL 3 DESCRIPTION	LEVEL 2 DESCRIPTION	LEVEL 1 DESCRIPTION
• Most elements are clearly and concisely identified • Almost all similarities and differences are identified • Almost all meanings, patterns or relationships are identified • Insightful elements and relationships are discussed	• Most elements are identified • Most similarities and differences are identified • Most meanings, patterns or relationships are identified • Insightful elements and basic relationships are discussed	• Some elements are identified • Some similarities and differences are identified • Some meanings, patterns or relationships are identified • Basic elements and relationships are discussed	• Limited elements are identified • A similarity and difference are identified • A meaning, pattern or relationship is identified • Basic elements are discussed

HUMANITIES AND SOCIAL SCIENCES
ACTIVITY 1

In medieval heraldry, it was common for a shield to represent a family or lineage. Study the image below and analyse what this shield suggests about its family's virtues.

SCIENCE
ACTIVITY 2

The Ponzo illusion was first demonstrated by the psychologist Mario Ponzo in 1911:



Analyse the image to determine which elements make it appear that the yellow line at the top of the image is larger than the one on the bottom.

DISCRIMINATE

DEFINITION:

Observe or note differences in order to make distinctions.

REAL-WORLD APPLICATIONS:

The action of discriminating is very important at school and in everyday life. In Science, we discriminate between plant and animal cells. We also discriminate between texts in English.

PROFICIENCY SCALE:

LEVEL 4 DESCRIPTION	LEVEL 3 DESCRIPTION	LEVEL 2 DESCRIPTION	LEVEL 1 DESCRIPTION
Student's work has demonstrated their knowledge and understanding of **discriminating**. Each level has the following characteristics:			
• Notes almost all differences • Makes clear and logical distinctions	• Notes most differences • Makes detailed distinctions	• Notes some differences • Makes some distinctions	• Notes limited differences • Makes limited distinctions

PHILOSOPHY AND REASON

ACTIVITY 1

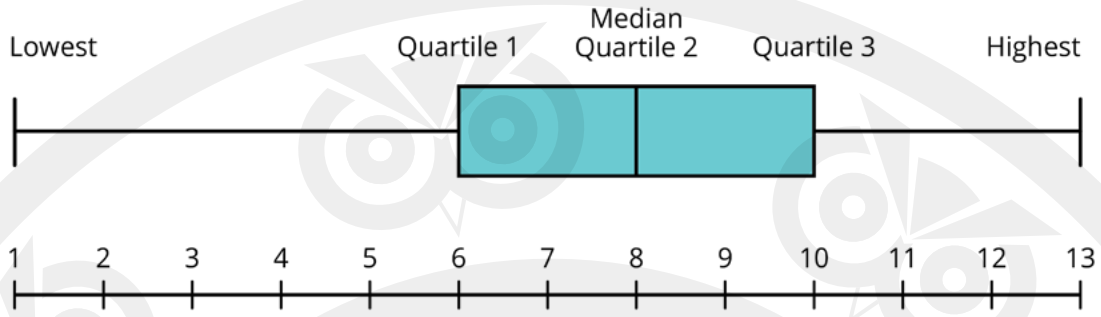
Read the following philosophical quotations and **discriminate** between their meanings.

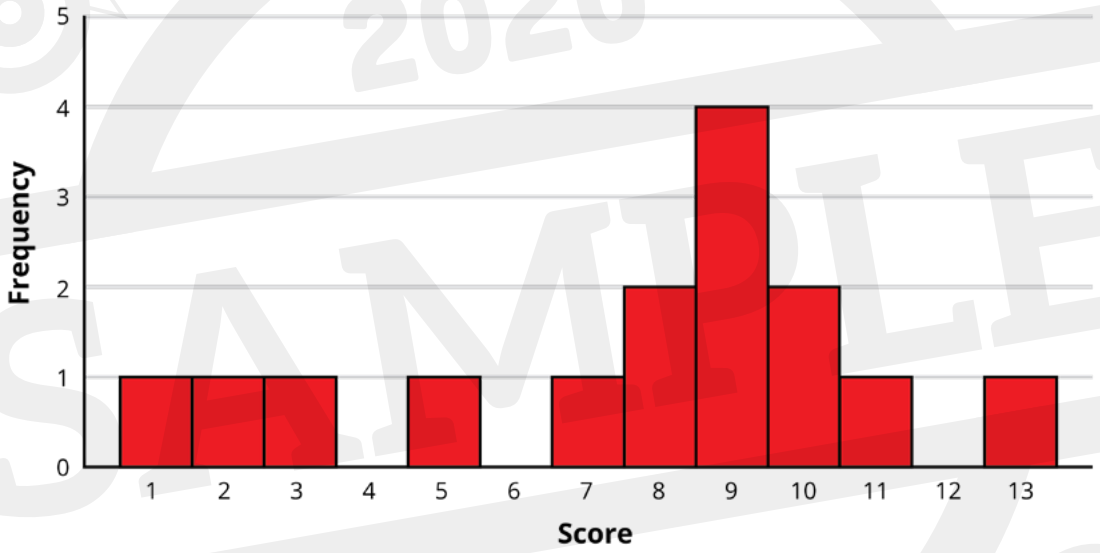
"To be is to be perceived (Esse est percipi)." Or, "If a tree falls in the forest and no one is there to hear it, does it make a sound?"—Bishop George Berkeley

"There are things known and there are things unknown, and in between are the doors of perception."—Aldous Huxley

MATHEMATICS
ACTIVITY 2

Discriminate between the following chart types based on the different types of information they convey.





EXPLORE

DEFINITION:

Look closely, to scrutinise or examine in greater detail.

REAL-WORLD APPLICATIONS:

The action of exploring is very important. We explore new concepts and ways of thinking every day at school. We explore the roles of different chemicals in Science, and we explore the use of different language techniques in English.

PROFICIENCY SCALE:

LEVEL 3 DESCRIPTION	LEVEL 2 DESCRIPTION	LEVEL 1 DESCRIPTION
Student's work has demonstrated their knowledge and understanding of **exploring**. Each level has the following characteristics:		
• Provides insightful purpose for exploration • Examines all relevant elements	• Provides reasonable purpose for exploration • Examines some relevant elements	• Provides basic purpose for exploration • Examines limited elements

HOW TO EFFECTIVELY EXPLORE:

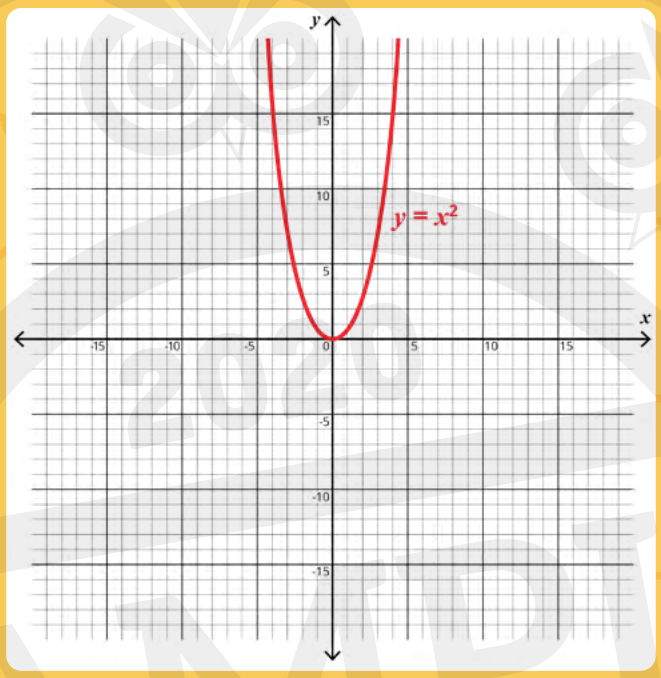
1. Identify the goal of exploring the subject or source.
2. Write down your current knowledge of the subject or source and identify what more needs to be known about it.
3. Do further research, or consider the topic in new ways to uncover new information.
4. Construct a detailed account of the information you have explored.

MATHEMATICS
ACTIVITY 1

The equation of a parabola can be represented in the following form, where a, b and c represent real numbers:

$$y = a(x + b)^2 + c$$

The following graph shows the function $y = x^2$.



Explore the effect of changing $a = 1$, $b = 0$ and $c = 0$ one at a time to $a = 4$, b = 4 and $c = 4$. This can be done by completing the tables of values and plotting three more functions alongside $y = x^2$. Briefly explain your results.

Function: $y = x^2 + 4$

x	−2	−1	0	1	2
y					

Function: $y = (x + 4)^2$

x	−6	−5	−4	−3	−2
y					

Function: $y = 4x^2$

x	−2	−1	0	1	2
y					

A ACTIVITY 27 (CS: DEVELOP, DETERMINE)

1. Length = $\frac{1}{2^{n-1}}$
2.

Stage	Length of each side
1	1
2	$\frac{1}{2}$
3	$\frac{1}{4}$
8	$\frac{1}{128}$
12	$\frac{1}{2048}$

A ACTIVITY 28 (CS: GENERATE)

Number of students not going to university = $n - \frac{n}{4} = \frac{3n}{4}$

Number of students working a trade = $\frac{3n}{4} \times \frac{18}{100} = \frac{27n}{200}$

COGNITIVE SKILLS

ANALYSE

A ACTIVITY 1

The shield features two rampant lions, facing each other with their claws drawn. This represents the family's courage, and perhaps even their skill in conflict. The symmetry of the battling lions could also express fairness and equality. These virtues, combined with the bright and bold colouring of the shield, suggest that the family is strong and proud.

A ACTIVITY 2

The yellow lines appear to be of different lengths because of the depth created by the train tracks. The vertical lines converge, and the horizontal tracks shorten, become thinner and are placed closer together according to a scale. This means the brain perceives the train track as being the same size at the top and bottom of the image, but just at different depths. The brain applies this same logic to the yellow lines, automatically perceiving them as being different lengths because they do not follow the same scale of depth as the train track. However, the lines are in fact the same length and thickness. Ultimately, the illusion confuses the brain by drawing the train tracks in perspective view to indicate depth, while the yellow lines are not drawn in the same perspective.

APPLY

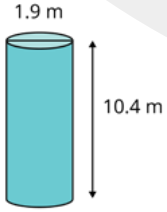
A ACTIVITY 1

a) $Volume = \pi r^2 h$

$r = \frac{1.9}{2} = 0.95$ m $\quad h = 10.4$ m

$V = \pi \times (0.95)^2 \times 10.4$

$V = 29.487$ m³



b) $\tan(\theta) = \frac{opp}{adj}$

$\theta = 35°$

$opp = \frac{30.9}{2} = 15.45$ m $\quad adj = h$

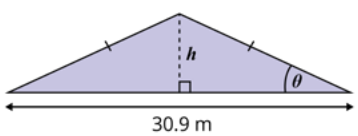
$\tan(35°) = \frac{h}{15.45}$

$h = 15.45 \times \tan(35°)$

$h = 10.818$ m

$A = \frac{30.9 \times 10.818}{2}$

$A = 167.14$ m²



c) $Height: width = 1{:}1.618$

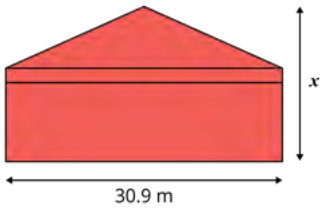
$Let\ height = x$

$\frac{x}{30.9} = \frac{1}{1.618}$

$x = \frac{1}{1.618} \times 30.9$

$x = 19.098$ m

$Height = 19.098$ m



ACTIVITY 2

The creation of an original and interesting narrative is a difficult task, which requires a thorough planning and drafting process. The development of interesting characters and an unpredictable plot is essential to the success of your writing. Further, the inclusion of long descriptions should be avoided in favour of sentences that "show" rather than "tell", as these grant more power to the imagination of the reader. Finally, the correct use of grammar and language conventions should not be overlooked, as this fundamental aspect of writing is of great importance to the clarity and structure of your work.

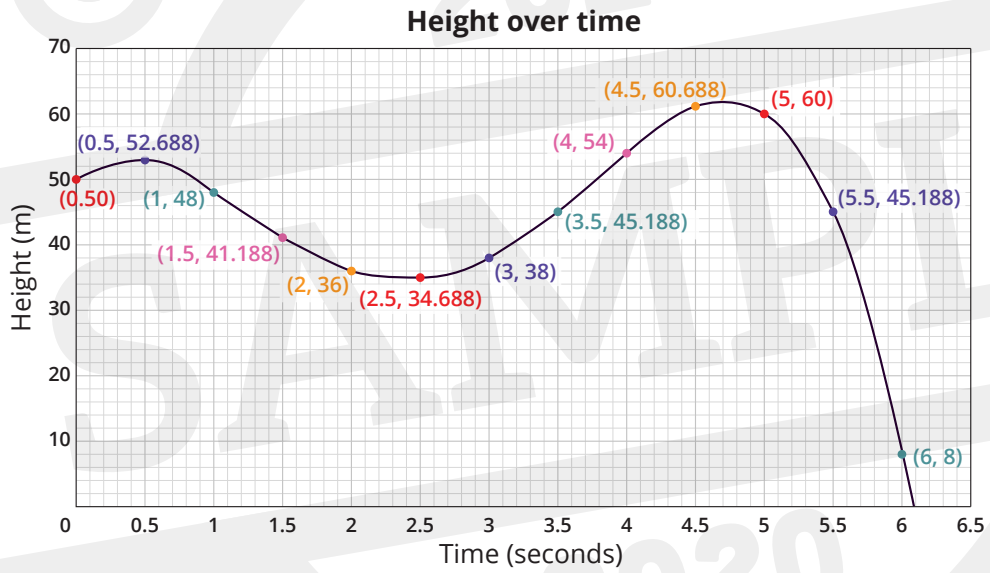
APPRAISE

ACTIVITY 1

After examining the given time line, it is evident that the discovery of gold in Ballarat and near Bathurst in 1851 was a significant event in Australia's history. Not only did it result in a boom that would have substantially increased the wealth of the nation, but it attracted migrants from all over the world, thus establishing the beginnings of a unique and multicultural country that has only continued to diversify. Finally, the environment in which the gold-diggers worked formed strong bonds among the workers, thus birthing the notion of "mateship" as integral to Australian identity. This is why the initial discovery of gold in 1851 was so important.

ACTIVITY 2

t	0	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
h	50	52.688	48	41.188	36	34.688	38	45.188	54	60.688	60	45.188	8



Brent said that the roller-coaster started 50 m off the ground, rose 2 m and began to drop in the first second. This is reflected by Brent's model. Brent then says that by two seconds in, the ride has dropped by 20 m, meaning that at $t = 2$, h should be equal to 32 m. In Brent's model, the roller-coaster is 36 m off the ground two seconds in, so this is not precise, but it does represent a drop. Brent says that the ride keeps dropping until it is 25 m off the ground. This is not reflected by Brent's model, which only drops to approximately 35 m off the ground. However, although the height is inaccurate, the ride does rise for two seconds after the drop, as described by Brent. The model shows the ride reaching a maximum height of about 62 m, although Brent said it reached 65 m before dropping.

Overall, the model does not always accurately reflect the height of the roller-coaster, although it does give a good approximation of when the roller-coaster rises and falls over the first six seconds.

APPRECIATE

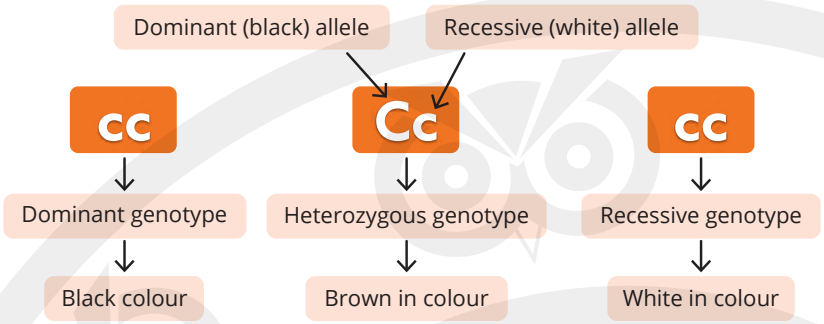
ACTIVITY 1

Huxley's *Brave New World* is a valuable piece of literature because it serves as a warning about an increasing reliance on technology and the potential for dictators to achieve absolute power. Given the time of its writing, the novel would have been an allegory for the likes of Hitler and Stalin, but it is still relevant over 80 years after its initial publication, when the threat of dictatorship, particularly in developing countries, is ever-present. Many of the quotes discuss a loss of individuality and humanity, as people are forced to both conform to technology and obey human leaders. The work offers a dystopian projection of reliance on technology, the consequences of totalitarian regimes and the expansion of consumerist ideologies, and it invites readers to question the world around them. Thus, despite being a fictional text, *Brave New World* resonates with real-world events and can be seen as a valuable piece of literature.

HYPOTHESISE

A ACTIVITY 1

Given that inheritance of colour in this particular species of cow follows a pattern of incomplete dominance, the following diagram can be used to represent the inheritance pattern.



The colour of the bull is black (genotype CC), and the cows are brown (genotype Cc) in colour. A Punnett square can be used to model the potential colour(s) of the calves:

Bull (CC) × Cow (Cc)

	C	C
C	CC	CC
c	Cc	Cc

Possible offspring:
CC (50%), Cc (50%)

The Punnett square shows that each time a black bull mates with a brown cow, there is a 50% chance of producing a calf of genotype CC and a 50% chance of producing a calf with genotype Cc. The calves can therefore be brown or black in colour. While the calves could hypothetically be any combination of black and/or brown that adds up to 50, given that there is an equal chance of producing a black or brown calf, it follows that the most likely combination of the offspring will be 50% black and 50% brown.

50% of 50 = 25

The offspring will therefore most likely consist of 25 black and 25 brown calves.

A ACTIVITY 2

Nazi control of Germany depended on promoting a particular ideology, achieved by propaganda and silencing opposing voices. By destroying books, the party was able to establish complete ideological dominance over the German people and deny them the opportunity to encounter subversive ideas that may have encouraged them to question Nazism.

The novels of foreigners on the opposing side of the war – such as Englishman HG Wells and American Ernest Hemingway – were banned to prevent any contact with the "enemy". Pacifist works were banned as they directly contradicted Germany's state of war. Furthermore, destroying the works of all Jewish authors further dehumanised and marginalised Jewish people.

IDENTIFY

A ACTIVITY 1

The argument is flawed because there is a possibility that Rachael is behind the curtain, but you just don't know that she is. The two statements that are made do not necessarily lead to the conclusion that has been drawn, and this is the error in the argument.

A ACTIVITY 2

Questions	Answers
a) **Identify** the number of alkali metals in the table.	7
b) **Identify** the percentage of alkali metals in the table to two decimal places.	First find how many alkali metals are in the table: 7. Now find how many elements are in the table: 119. Percentage of alkali metals = 7 ÷ 119 x 100 = 5.88%.
c) **Identify** the number of elements with only artificially made isotopes.	24
d) **Identify** the elements on the table that are gases at standard temperature and pressure.	H, He, N, O, F, Ne, Cl, Ar, Kr, Xe, Rn, Uuo