
Engaging in Reading: Most/Least Important Idea(s) and Information – Reading a Problem

MATHEMATICS

Whether your preferred Problem Solving model, is a 3-step, 4-step (e.g., Polya model), or n -step outline, the first step is always “Read and understand the problem”. *Reading* a problem is not the same as *understanding* a problem, and not *understanding* a problem is not alleviated by simply reading it over again, more carefully and slowly. Learning styles, “chunking”, as well as decoding the text, play a significant part in *reading* a mathematics problem. The KMWC (Know/Model/Words/Cross out) graphic organizer breaks *reading* down into 4 steps (see the Student Resource, *Reading a Problem – The KMWC Template*) which guide readers from print to understanding of both the information and the question contained within a word problem.

Purpose

- Read and understand problems by:
 - *unblocking* information presented in a block of text
 - representing information in an alternate format.

Payoff

Students will:

- be able to read a word problem with understanding.
- develop their ability to identify the relevant parts within a problem stated in a block of text.
- have visual or concrete representations, as well as textual descriptions, of a problem before attempting to solve the problem.

Tips and Resources

- Determining the main ideas in a mathematics problem is not always a clear, straightforward process. “Mathematics texts contain more concepts per word, per sentence, and per paragraph than any other text (Brenan & Dunlap, 1985; Culyer, 1988; Thomas, 1988). In addition, these concepts are often abstract, so it is difficult for readers to visualize their meaning.”
- People read with understanding in different ways; what is natural and comfortable for one is awkward and difficult (if not impossible) for another. For example, one person can *read* mathematical text simply by looking at it with hands folded in his or her lap; another person cannot *read* the same mathematical text without a pen or pencil in their hand to circle, underline, highlight or otherwise graphically interact with the written text.
- Simple intensity of concentration and/or reading speed is often insufficient criteria for the understanding of a word problem.
- Learning styles, as well as decoding the text, play a significant part in *reading* a mathematics problem.
- For a blank template that can be handed out in class, see student resource, *Reading a Problem – The KMWC Template*. (Note: this template is NOT a problem-solving template; it is a problem-reading template.)

See Teacher Resource, *Reading a Problem – KMWC Tips*.

See Student/Teacher Resource, *Reading a Problem – KMWC Example*.

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Further Support

- See Teacher Resource, *Reading a Problem – KMWC Tips*.

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MATHEMATICS

What teachers do	What students do
<p>Before</p> <ul style="list-style-type: none"> Find an example problem in which the information and question are not immediately obvious. Model reading the problem using the KMWC graphic organizer. Assign the intended problem. 	<ul style="list-style-type: none"> Scan the problem.
<p>During</p> <ul style="list-style-type: none"> Direct students to use the KMWC graphic organizer with a selected problem. When students begin to list facts be accepting of all facts regardless of whether the information is extraneous to the problem. Circulate among the students in order to assist with any terminology or concepts that need clarifying. Watch for misinterpretations of the given facts. 	<ul style="list-style-type: none"> Use the graphic organizer to: <ul style="list-style-type: none"> Make a list of all facts contained in the problem. Identify any terminology or concepts that need defining or explaining before going on to the next stage. Make a model of the situation as described by the facts from stage 1. The model can be a diagram, a construction with manipulatives or whatever the student might create to develop a concrete/visual representation of the facts. Estimate any unknown quantities Restate the problem in his/her own words. Cross out the listed facts that are not necessary.
<p>After</p> <ul style="list-style-type: none"> Direct students to solve the problem. 	<ul style="list-style-type: none"> Proceed with the solving of the problem.

Notes



Reading a Problem – KMWC Tips

Teachers often ask the students to read a problem and then quickly move into discussions with the class, groups, or individual students about possible strategies for approaching the problem. But far too often the students, after looking at the problem, have actually not been able to read it with understanding. The attached graphic organizer addresses this problem on several levels. The KMWC model has four stages:

K: What facts do I **KNOW** from the information in the problem?

At this first stage, students are asked to write down the facts given in the problem. While this seems like a simple and obvious task, there are at least three major considerations to be aware of around it.

- (i) For students who have been traditionally unsuccessful at problem solving, the decoding of a word problem has become a daunting task because it has never, or at least infrequently, led to the satisfaction of success. So the first thing that these students need is the built-in success that comes with a simple task — but one that actually moves forward in the process of problem solving. Writing down the facts within a word problem is first of all a simple task that they can understand and at which they can immediately experience success, and second, a means of breaking apart a block of words and numbers.
- (ii) There is a temptation for teachers to try to be ‘helpful’ but that help may inadvertently decrease student independence. For example, in observing a student writing down the facts of the problem, teachers might notice that a student wrote down something unimportant to the problem like, “It was winter.” The temptation might be, with all the best intentions of helping the student save time, say to the student that it was not necessary to record that it was winter. What we fail to realize in such a situation is that while the student was engaged in a part of problem solving that they finally understood, we have come along and, while trying to be helpful, unconsciously given them the message that they don’t actually know what to do. Just when the student was finally doing some problem solving activity that they understood, the student is told (or rather the student ‘hears’) that they really don’t understand - we’ve inadvertently discouraged student initiative.
- (iii) This is NOT the time to have all students try to leave out or cross out any unnecessary information given in the word problem. Although this is a good strategy for the confident reader, students who have trouble getting past the problem itself are often not able to distinguish between relevant and irrelevant information. Insisting on them trying to cross out extraneous information sometimes leads to the crossing off of necessary information. [See Stage 4 in **KMWC**.]

This first stage is also the time when the students discover words, phrases or concepts that are included in the wording that they don’t know and must ask about before they can proceed any farther.

Teacher Resource

Reading a Problem – KMWC Tips (continued)**M:** Can I **MODEL** the situation with a picture or manipulatives?

The second stage takes into account the fact that not everyone *reads* the same way. It is well established that there are various learning styles and for many people it is very important for conceptual understanding that they be given the opportunity to create a concrete or visual representation of a stated situation - a model of some sort - whether with manipulatives or through a drawing/diagram. Hence, the second stage is the opportunity (offered only, not necessarily required) for modeling the facts picked out in the first stage.

This is also the stage in problem solving when students might have to estimate quantities or measurements that are not explicitly given but only indirectly described.

W: **WHAT** does the problem ask me to find?

It is only in this third stage that many students are able to state in their own words (if the problem was not originally absolutely clear), what the problem was asking for. Often students are asked to read the problem and to immediately re-state it in their own words; this not only often doesn't get done but also builds anxiety in students around problem solving in general. It is very important that students be able to put into their own words any word problems that are not immediately clearly understood if the students are going to be able to consider possible strategies that address the problem.

C: **CROSS OUT** any facts that are not needed.

At this stage it is safe to ask even the non-confident reader to cross out the facts from the first stage that are not needed. Understanding the problem situation gives insight into what facts may or may not pertain to what is being asked.

If a student still is not sure of what facts are important or unimportant, let them work on a solution to the problem (whether as a class, in groups or alone). And then, after a solution has been obtained have the student go back and cross out what now would be obvious as not having been necessary facts or information. While it may seem at first to be a bit redundant to do this after a solution has been obtained, it is critical to note that students who could not identify irrelevant information in the word problem at the outset will not quickly develop that skill unless you give them the opportunity to practice looking at those facts and seeing them as irrelevant. It does not matter that this may only be possible for a while at the end of the problem solving. What matters is that those facts are finally recognized as unnecessary information in the context of the problem situation. This development must not be by-passed.



Reading a Problem - The KMWC template

K: What facts do I **KNOW** from the information in the problem?

“What words or ideas don’t I understand?”

M: Can I **MODEL** the situation with a picture or manipulatives?

“Is there any missing information that I can estimate?”

W: **WHAT** does the problem ask me to find?

C: **CROSS OUT** any facts that are not needed.



Student/Teacher Resource

Reading a Problem – KMWC Example (Grade 7)

Problem:

Marek got a puppy for Christmas. Wanting to create a ‘dog run’ (without a roof) in their large backyard, Marek persuaded his father to buy enough chain link fencing to create a rectangular ‘dog run’ 50m long and wide enough for the puppy, keeping in mind that the puppy would grow in size. When Marek’s friend Tristan asked if he could bring over his dog, a Labrador retriever, to exercise in the ‘dog run’, Marek laughed and said that Tristan’s dog would rub off his fur if he tried to use the ‘dog run’. Tristan complained that Marek could have used the same amount of fencing to give his puppy more area to run around in and also have created a ‘dog run’ that Tristan’s dog could have used. Is this true? Justify your answer.

K: What facts do I KNOW from the information in the problem?
<ol style="list-style-type: none"> 1. Marek got a puppy for Christmas 2. created a rectangular ‘dog run’ without a roof in a large backyard 3. it was 50 m long 4. it was wide enough for a puppy that would grow 5. Marek has a friend named Tristan who has a Labrador Retriever 6. a Lab would rub off its fur in the dog run 7. Tristan claimed a wider dog run with the same amount of fencing could have more room for the puppy <p><i>“What words or ideas don’t I understand?”</i> e.g., dog run, Labrador retriever</p>
M: Can I MODEL the situation with a picture or manipulatives?
<div style="text-align: center;"> <p>0.5 m Perimeter = 101 m</p> <p style="margin-left: 100px;">50 m</p> <p><i>“Is there any missing information that I can estimate?”</i> : The width is maybe 0.5 m</p> <p>2m Perimeter = 101 m</p> <p style="margin-left: 100px;">48.5 m</p> </div>
W: WHAT does the problem ask me to find?
<p>Is it true that the area of the wider dog run is larger than the area of the first one?</p>
C: CROSS OUT any facts that are not needed.

Facts #1,4 and 5 are not needed, as well as “large backyard” in #2.



Reading a Problem – KMWC Example (Grade 9)

Problem:

Gina and Tamiya lived in different neighbourhoods but were the best of friends at school. Each had a regular babysitting customer and each one was paid at the end of any week that they babysat. Gina was paid a flat amount for anything up to 10 hours after which she was paid an extra \$10/hr. Tamiya was given \$15 to cover any bus fare she might have paid for that week plus an hourly rate.

At lunch on Mondays, the two girls would usually talk about how much money they had made by babysitting the previous week. One time during such a conversation they discovered that they had both babysat for the same number of hours that week. What was even more unexpected was that they had each earned the same amount for the week as well, namely \$100.

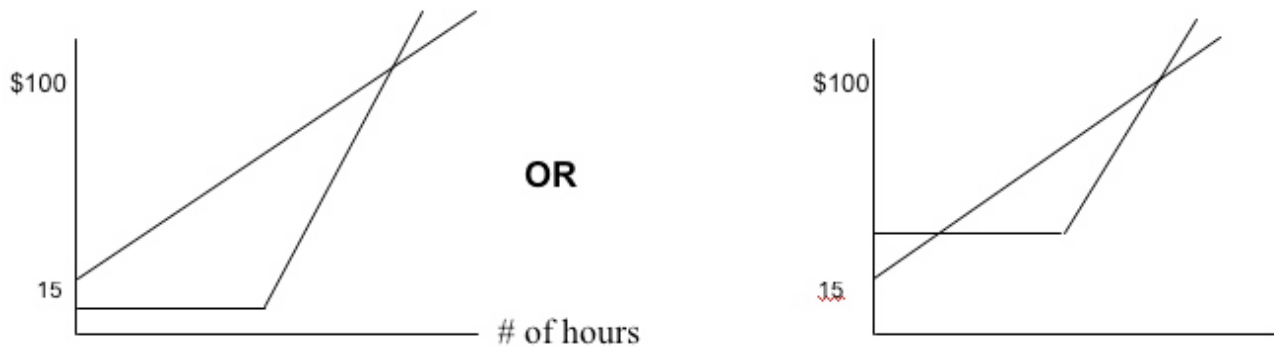
Is it possible that some other week they could have each babysat the same amount of hours and again earned the same amount, but different from \$100? Justify your answer.

K: What facts do I KNOW from the information in the problem?

1. Gina and Tamiya lived in different neighbourhoods
2. Gina and Tamiya were the best of friends at school
3. Each had a regular babysitting customer
4. Each was paid at the end of any week that they babysat
5. Gina was paid a flat amount up for anything up to 10 hours after which she was paid an extra \$10/hr
6. Tamiya was given \$15 plus an hourly rate
7. At lunch on Mondays, the two girls would talk about how much money they had made by babysitting
8. They discovered that they had both babysat for the same number of hours and both earned \$100

“What words or ideas don’t I understand?” e.g. flat amounts

M: Can I MODEL the situation with a picture or manipulatives?



“Is there any missing information that I can estimate?”

W: WHAT does the problem ask me to find?

Can the graphs of the pay rates cross each other more than once?

C: CROSS OUT any facts that are not needed.

Facts #1,2,3,4 and 7 are not needed.