FACILITATOR'S GUIDE

2018 TRAINING WORKSHOP NO.1

MATHEMATICS

GRADE 4-7

PILO

IMPROVING LEARNER PERFORMANCE

education

Department:
Education
PROVINCE OF KWAZULU-NATAL

Grades 4 to 7
Just-in-Time Training Workshop
2018: No.1

Facilitator's Guide

Mathematics

Endorsed by:

Jika iMfundo
what I do matters

NOTE TO THE FACILITATOR

Before you start, make sure the teachers are sitting in groups.
You will find that often teachers from the same school sit together. This is both good and bad.

- *It is good because they will know each other and share easily with one another.*
- *It is bad because they probably all have similar problems. By putting them in new groups, they will get an opportunity to discuss their problems with teachers from other schools and can maybe assist one another with problems they have solved already.*

To form groups:

STEP 1: Decide on the size of your group (5 or 6 in a group is a good size)

STEP 2: Mentally divide the number of teachers in your group by 5 (or 6).
Suppose you have 30 teachers. $30 \div 5 = 6$. So, you will have 6 groups of 5.

STEP 3: Because there are going to be 6 groups, go around the class, numbering the teachers from 1 to 6.
Tell the teachers to remember their numbers (NOTE: they are bad at this!)

STEP 4: Tell the 1s to form a group, the 2s to form a group, and so on.
If they have remembered their numbers, you should have 6 groups of equal size.
If you don't have groups of equal size, move teachers around to get equal-sized groups.

Briefly go over the program with the teachers

WORKSHOP PROGRAM – GRADES 4 to 7

(Found on page 1 of the Participant's Handout)

Session 1: 40 minutes	**THE TRACKER** **1.1 Key points of the tracker** A summary of the key points **1.2 Aspects of the tracker that are still puzzling** Brief discussion of any parts of the tracker that still need explanation
Session 2: 2 hours	**PLANNING FOR TERM 2** **2.1 Time available for teaching in Term 2** Engage with calendar and any other relevant documents **2.2 What does the curriculum tell us about the teaching of Measurement in Grades 4 to 7?** Engage with both the Intermediate Phase and Senior Phase CAPS (Relevant pages given at the end of this Guide) **2.3 Conclusions and Suggestions** How to cope in Term 2
Session 3: 2 hours	**THINGS TO THINK ABOUT BEFORE PREPARING FOR TERM 2** **3.1 What do the ANAs tell us about the problem areas in Measurement?** Looking at the results of the 2014 ANAs **3.2 Assisting the learners with Conversions** Hints to help you teach Conversions. **3.3 Answering teacher's questions about the work covered in Term 2.** Discuss the questions with your group. **3.4 What about the June Exams?** Engaging with exam questions and cognitive levels **3.5 Conclusion** Have all your questions been answered? Make a list of topics to be covered in the next JiT workshop.

SESSION 1: THE TRACKER

NOTE TO THE FACILITATOR

(allow 40 minutes for this session)

The purpose of the trackers is to assist the teachers to finish teaching the curriculum in such a way that learning happens.

Your teachers have now used the tracker for one term.

1.1: KEY POINTS OF THE TRACKER

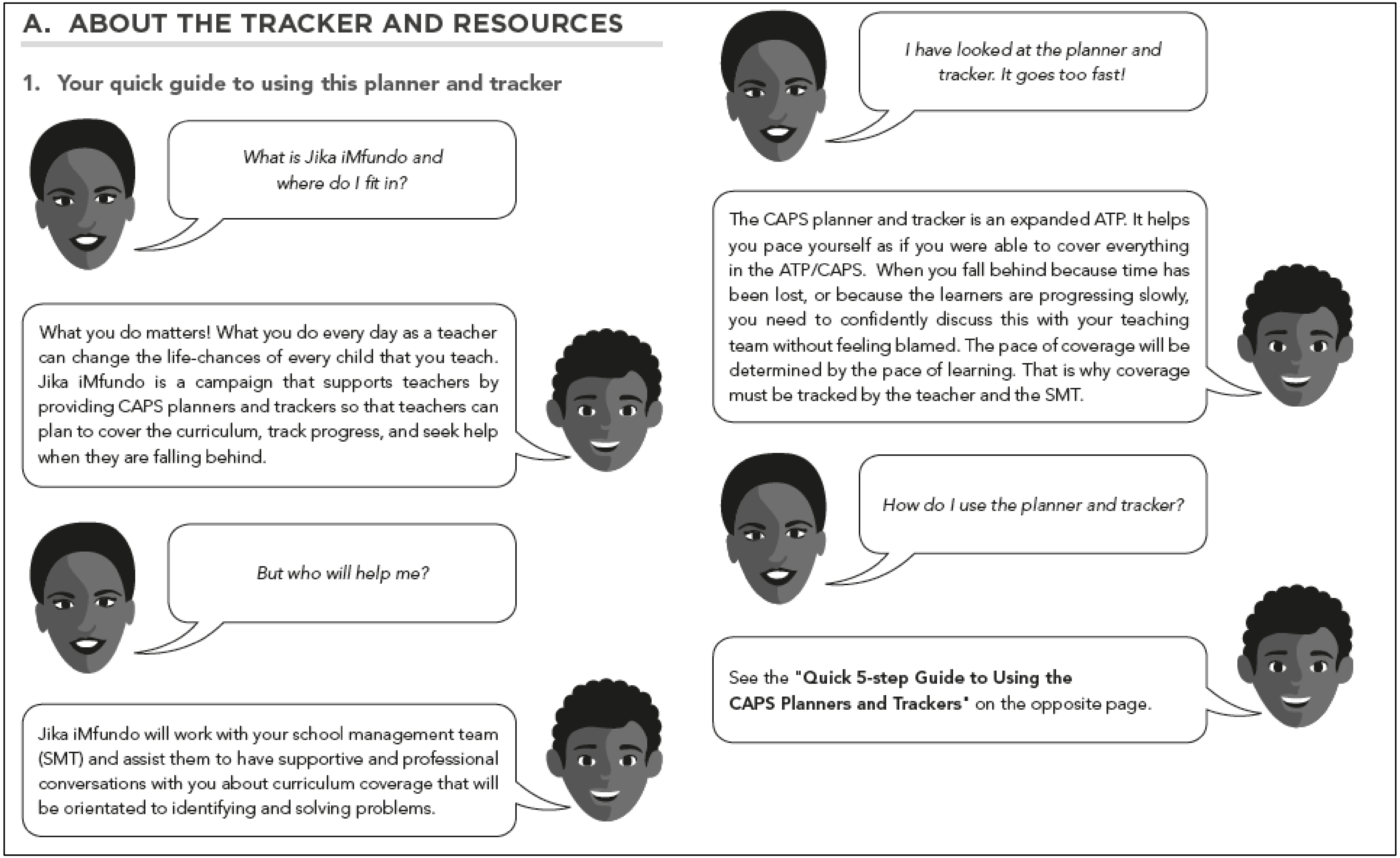
10 minutes	*Make sure that the teachers are aware of the key points of the tracker (see the information given on the next 3 pages)* *Go though information with them.*

1.2: ASPECTS OF THE TRACKER THAT ARE STILL PUZZLING

Allow the teachers 30 minutes in total to discuss aspects of the tracker that are puzzling.
Don't allow them more time than this – tell them that they will have time at the end if there are still things that they are not sure of.

10 minutes	*The teachers discuss with their group any aspects of the tracker that they are still not sure of.* ***(Time this carefully)***
10 minutes	• *Ask one group to report back to the class. Write their points on flip chart paper.* • *Then, without allowing any discussion, ask a second group if they have anything to add. (Don't let them mention points already mentioned). Write these points on the flip chart paper.* • *Then, ask the rest of the groups if they have any other points to add to this list. Only allow new points to be added to this list. (**Again, only allow 10 minutes for the group report back**.)*
10 minutes	*Discuss the points on the flipchart with the whole group. Try not to get bogged down by the teachers' complaints.* *Leave the flipchart up for the rest of the workshop session, and wherever possible, refer back to it.*

1.1: KEY POINTS OF THE TRACKER *(found on page 2 of the Participant's Handout)*



A. ABOUT THE TRACKER AND RESOURCES

1. Your quick guide to using this planner and tracker

What is Jika iMfundo and where do I fit in?

What you do matters! What you do every day as a teacher can change the life-chances of every child that you teach. Jika iMfundo is a campaign that supports teachers by providing CAPS planners and trackers so that teachers can plan to cover the curriculum, track progress, and seek help when they are falling behind.

But who will help me?

Jika iMfundo will work with your school management team (SMT) and assist them to have supportive and professional conversations with you about curriculum coverage that will be orientated to identifying and solving problems.

I have looked at the planner and tracker. It goes too fast!

The CAPS planner and tracker is an expanded ATP. It helps you pace yourself as if you were able to cover everything in the ATP/CAPS. When you fall behind because time has been lost, or because the learners are progressing slowly, you need to confidently discuss this with your teaching team without feeling blamed. The pace of coverage will be determined by the pace of learning. That is why coverage must be tracked by the teacher and the SMT.

How do I use the planner and tracker?

See the **"Quick 5-step Guide to Using the CAPS Planners and Trackers"** on the opposite page.

QUICK 5-STEP GUIDE TO USING THE CAPS PLANNERS AND TRACKERS

1. Find the textbook that YOU are using.
2. Use the planning page each week to plan your teaching for the week. It will help you link the CAPS content and skills to relevant material in the textbook, the teacher's guide, and other materials such as the DBE workbook.
3. Keep a record of the date when you were able to complete the topic. It may be different from the date you planned, and for different classes. Write this date in the column on the right for your records.
4. At the end of the week, reflect and check if you are up to date. Make notes in the blank space.
5. Be ready to have a professional and supportive curriculum coverage conversation with your HoD (or subject or phase head).

The CAPS planners and trackers also provide guidelines for assessment with samples, and may also have enrichment and remedial suggestions. Read the introduction pages carefully for a full explanation.

If this is a campaign, who is part of it?

All teacher unions in KwaZulu-Natal support Jika iMfundo because they believe it will help teachers in their work. The district director, circuit managers and subject advisers are leading Jika iMfundo in your district because they believe that we can improve learning if we improve curriculum coverage. You, as a teacher, and your colleagues on the staff and the SMT of the school are invited to join Jika iMfundo. Because what you do matters.

If you see mistakes in the planners and trackers, please send details of these to admin@pilo.co.za.

If you would like to be kept informed about developments in Jika iMfundo, send the following information to admin@pilo.co.za:

- your cell phone number
- the grade/s you teach
- the subject/s you teach.

We will add you to a WhatsApp group that will operate in your circuit.

Look for Jika iMfundo on Facebook.

A. ABOUT THE TRACKER AND RESOURCES (continued) This is followed by advice to the teacher under the following headings: 2. Purpose of the tracker 3. Links to the CAPS 4. Links to the approved sets of Learner's Books and Teacher's Guides 5. Links to the DBE workbooks and the *Sasol Inzalo Mathematics* ***books*** 6. Managing the time allocated in the tracker 7. Sequence adherence 8. Links to assessment 9. Resources **B. LESSON PREPARATION KEY STEPS** The tracker then gives you advice about lesson preparation under the following headings: 1. Review the term focus 2. Prepare resources 3. Prepare the content 4. Plan the steps in your lesson, and think carefully about how much time to allocate to different learner activities 5. After each lesson, reflect on how it went.	**C. PLANNING FOR ASSESSMENT** The tracker gives advice on assessment under the following headings 1. Formal assessment, including a formal assessment term plan for each set of LTSMs 2. Informal assessment **D. TRACKERS FOR EACH SET OF APPROVED LTSMs** • Search for your LTSM and use those pages to guide your teaching. • Also look at other LTSMs (especially ones that you have copies of) and see if you can get assistance from them. • Each week in the tracker has place for you to reflect about your teaching in that week. Use the space provided for you **E. ASSESSMENT RESOURCES** • Formal Assessment Record Sheet • Mid-Year Examination • Memorandum and Cognitive Levels • Analysis of the Cognitive Levels of the Mid-Year Examinations.

1.2: ASPECTS OF THE TRACKER THAT I STILL FIND PUZZLING. *(found on page 4 of the Participant's Handout)*

Write your notes here

SESSION 2: PLANNING FOR TERM 2

NOTE TO THE FACILITATOR

(Allow 2 hours for this session)

We need to encourage the teachers to be more reflective teachers who know how children learn, the principles of teaching, the subject content, etc.

In this Session, the teachers engage with:

- *The number of hours they have in Term 2 to cover the required content*
- *The content they are required to teach, as given in CAPS Intermediate Phase and Senior Phase Mathematics.*

2.1: TIME AVAILABLE FOR TEACHING IN TERM 2

40 minutes	*The teachers use the given calendars to work out the number of hours they have available for teaching in Term 2.* *i) They mark any days in Term 2 in their school where there will be no teaching (sports meetings, etc)* *ii) They mark when June exams start and whether any days have been set aside for revision.* *iii) There are 6 $\frac{1}{2}$ hours allocated each week for the teaching of maths in the Intermediate Phase and 4 $\frac{1}{2}$ hours allocated each week for the teaching of maths in the Senior Phase, and the teachers know their timetable i.e. the number of hours of maths a class has on Monday, Tuesday, Wednesday, Thursday and Friday. They fill the number of hours on each available day on the calendars.* *iv) They total up the number of hours they have available in Term 2 for teaching.*

2.2: WHAT DOES THE CURRICULUM TELL US ABOUT GRADE 4 TO 7 MEASUREMENT?

40 minutes	*i) The teachers work out the number of hours that the CAPS allocates to Measurement in Term 2. To answer these questions, they need to refer to the Grade 4 to 7 Time Allocations per topic (given at the end of this Guide).* *ii) The teachers engage with the Grade 4 to 7 Measurement Phase Overviews (given at the end of this Guide).* *- They work out in which terms each Content Area is taught.* *- They study the Measurement topics and say what is the same and what is different.* *- They then investigate the teaching of perimeter, area, surface area and volume in Grade 7.*

2.3: CONCLUSIONS AND SUGGESTIONS

40 minutes	*i) Discuss the Conclusion and Suggestions with the whole class.* *ii) Allow the teachers time to discuss ways of coping with their groups* *iii) Allow the groups time to share their suggestions with the rest of the class. Suggest that they write any further suggestions down.*

2.1: TIME AVAILABLE FOR TEACHING MATHS IN TERM 2 *(found on page 5 of the Participant's Handout)*

In order to plan your teaching for Term 2, it is important to work out how many actual teaching hours you have.

1) Use the calendars on the next page to work out the number of hours you actually have to teach in Term 2 as follows:

   a) Mark in any days in Term 2 when there will be no teaching in your school (i.e. when you have sports meetings or things like that)

   b) Mark when the June exams start and days that have been set aside for revision.

   c) In the 2nd term, the Intermediate Phase CAPS allocates 60 hours of teaching @ 6 hours/week, and the Senior Phase CAPS allocates 45 hours of teaching @ 4,5 hours/week.

      Choose one of the maths classes you teach. Fill in the number of hours (or minutes) you teach them each day of the week.

2) Count up the number of hours you have available for teaching this class in Term 2 and write it below.

   I have the following number of teaching hours in Term 2 in 2018:

   ....

   ....

(Found on page 6 of the Participant's Handout)

April 2018

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
						1
2	3	4	5	6	7	8
9	10 School starts	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27 Freedom Day	28	29
30 School holiday						

May 2018

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
	1 Workers Day	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

June 2018

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16 Youth Day	17
18	19	20	21	22 School ends	23	24
25	26	27	28	29	30	

2.2: WHAT DOES THE CURRICULUM TELL US ABOUT THE TEACHING OF MEASUREMENT IN GRADES 4 TO 7? *(found on page 7 of the Participant's Handout)*

1) According to the Time Allocation Per Topic in CAPS (given at the end of this handout), how many hours should be spent on Measurement in the second term?

Grade 4? *7 hours*

Grade 5? *6 hours*

Grade 6? *5 hours*

Grade 7? *7 hours + 8 hours = 15 hours*

2) Study the Phase Overviews (given at the end of this handout). Which Grade teaches the listed topic in each term. The first topic has been done for you.

	Term 1	**Term 2**	**Term 3**	**Term 4**
Time	***Gr 4, 5, 6***			
Length		*Gr 4, 5*	*Gr 6*	
Capacity (volume)	*Gr 5*	*Gr 6*	*Gr 4*	
Mass			*Gr 5, 6*	*Gr 4*
Temperature			*Gr 5, 6*	
Perimeter and area of 2D shapes		*Gr 7*		*Gr 4, 5, 6*
Volume		*Gr 7*		*Gr 4, 5, 6*
Surface Area of 3D objects		*Gr 7*		

3) Which measurement topics are taught in the second term?

Grade 4: *Length*

Grade 5: *Length*

Grade 6: *Capacity*

Grade 7: *Perimeter and Area; Volume and Surface Area*

4) Consider the teaching of **length** in Grades 4, 5 and 6

   a) What content is the same?

      Practical measuring of 2D shapes and 3D objects by estimating, measuring, recording, comparing and ordering

      Measuring instruments: Rulers, metre sticks, tape measures, trundle wheels

      Units: mm; cm; m; km

      Solve problems in contexts involving length

   b) What is different?

      Gr 4 and 5:
      Conversions between mm and cm; cm and m; m and km. Conversions limited to whole numbers and common fractions

      Gr 6:
      Conversions between any of mm, cm, m, km. Conversions should include common fractions and decimal fractions to 2 decimal places.

5) Consider the teaching of **capacity** in Grades 4, 5, and 6

   a) What content is the same?

      Practical measuring of 2D shapes and 3D objects by estimating, measuring, recording, comparing, ordering

      Measuring instruments: Measuring spoons, measuring cups, measuring jugs

      Solve problems in contexts involving capacity

   b) What is different?

      UNITS: Grade 4 and 5: mℓ; ℓ

      Grade 6: mℓ; ℓ; kℓ

      CONVERSIONS: Gr 4 AND 5: Converting between ℓ and mℓ

      Conversions limited to whole numbers and common fractions

      Gr 6: Conversions between kℓ; ℓ; mℓ

      Conversions should include common fractions and decimal fractions correct to 2 decimal places

6) Consider the teaching of **perimeter** in Grades 4, 5, 6 and 7

   a) Describe what Grade 4, 5 and 6 learners cover when studying Perimeter.

      Measure perimeter using rulers or measuring tapes

   b) Describe what Grade 7 learners cover when studying Perimeter.

      Calculate the perimeter of regular and irregular polygons

      Use formulae to calculate the perimeter of squares, rectangles and triangles

      Solve problems involving perimeter to at least 1 decimal place

7) Consider the teaching of **area** in Grades 4, 5, 6 and 7

   a) Describe the topic that the Grade 4, 5 and 6s all cover when studying area.

      Find areas of regular and irregular shapes by counting squares on grids to develop an understanding of square units

   b) What more does Grade 6 cover that Grades 4 and 5 don't?

      Develop rules for calculating the areas of squares and rectangles

   c) Describe what Grade 7 learners cover when studying area

      Use appropriate formulae to calculate the area of squares, rectangles and triangles

      Solve problems involving perimeter and area of polygons to at least 1 decimal place

      Use and convert between appropriate SI units including $mm^2 \leftrightarrow cm^2$ *and* $cm^2 \leftrightarrow m^2$

8) Consider the teaching of **surface area and volume** covered in Grade 7

   a) Grade 7 learners have to know how to calculate the surface area, volume and capacity of certain 3D objects. What are they?

      Cube and rectangular prism

   b) Grade 7 learners have to be able to convert between certain volume units. What are they?

      $mm^3 \leftrightarrow cm^3$ *and* $cm^3 \leftrightarrow m^3$

   c) Grade 7 learners have to be able to convert between certain volume and capacity units. What conversions must they know?

      $1\ cm^3 \leftrightarrow 1\ m\ell$ *and* $1\ m^3 \leftrightarrow 1\ k\ell$

2.3: CONCLUSION AND SUGGESTIONS
(found on page 11 in the Participant's Handout)

After working through these previous two sections, you will be aware that you are going to have to plan Term 2 carefully in order to cover all the topics listed in CAPS.

You will also be aware that a lot of the Measurement topics are covered in Grades 4, 5, 6 and 7.

SUGGESTIONS

EITHER go through the Tracker for your chosen LTSM.
Do you have the same number of lessons in Term 2 that the Tracker expects you to have?
If not, you are going to have to take the Term 2 Tracker and your LTSM and work out how you are going to adjust your lessons.

Discuss with the group any other ways of coping with the work that needs to be covered in Term 2 and write down what you are going to do in the space below.

OR go through the ATPs and the LTSM to which it refers.
Do you have the same number of lessons in Term 2 that the Tracker expects you to have?
If not, you are going to have to take the Term 2 ATP and the LTSM and work out how you are going to adjust your lessons.

Discuss with the group any other ways of coping with the work that needs to be covered in Term 2 and write down what you are going to do in the space below. (Note that some ATPs have brought work into Term 2 from Term 3; this also needs to be completed, so you should consider the CAPS weighting for these topics, too.)

Write down what you are planning to do to cope with the work that needs to be covered in Term 2.

Answers here will vary

SESSION 3: THINGS TO THINK ABOUT BEFORE PREPARING FOR TERM 2.

NOTE TO THE FACILITATOR

(Allow 2 hours for this session)

More reflective teachers need to know what the problem areas are so that they can adjust their teaching to address these and ensure that learners do not proceed with gaps.
They also need to know how to set assessment questions and tasks that contain all four cognitive levels so that they can be sure that learners are covering the curriculum at the right levels.

3.1: WHAT DO THE ANAs TELL US ABOUT PROBLEM AREAS IN MEASUREMENT?

20 minutes	*The teachers read the extract from the ANA Diagnostic Report.* *They work with their group to answer the questions and discuss what this means for their teaching.*

3.2: ASSISTING TEACHERS WITH CONVERSIONS

15 minutes	*Explain the three diagrams to the teachers.* *Suggest that they make posters for the wall of the classroom for the learners to refer to. (Remind them to take the posters off the wall when tests and exams are written)*
15 minutes	*Use the two given examples to explain to the teachers that learners don't need to learn the Area and Volume conversions off by heart.*

3.3: ANSWERING TEACHERS' QUESTIONS ABOUT THE WORK COVERED IN TERM 2

15 minutes	*Teachers work with their group to answer questions*
15 minutes	*They discuss their answers with the rest of the class.*

3.4: WHAT ABOUT THE JUNE EXAMS?

Tell the teachers that they need to make sure that the June exams have questions at all four Cognitive Levels, in the approximate percentages as shown on the Cognitive Level Table.

10 minutes	*Discuss the table of Cognitive Levels with the teachers*
10 minutes	*The teachers answer the exam questions and decide on the level of each question*
10 minutes	*They discuss the answers and the levels with the rest of the class.* *The teachers explain why they allocated the cognitive levels that they did*

3.5: CONCLUSION

10 minutes	*Look at the flip chart from the first session.* *Discuss any questions that have not yet been answered.* *Make a list of topics to be covered in the next JiT Training Workshop.*

3.1: WHAT DO THE ANAs TELL US ABOUT PROBLEM AREAS IN MEASUREMENT? *(found on page 12 of the Participant's Handout)*

Work with your group to answer the following questions:

Use the extract from "The Annual National Assessment of 2014 Diagnostic Report, Intermediate and Senior Phases – Mathematics" given on the next two pages to plan the answers to the following questions.

1) In which content area did the Grade 4, 5 and 6 learners do worst?

The Gr 4, 5 and 6 learners did worst in Measurement

2) Which topics in this content area did they do worst in?

They did worst in

- *Time (calculation of time intervals, calculation of time in hours and minutes, time zone maps and calculating time)*
- *Conversions (conversions of units in measurement, arranging units of measurements from the least to the most)*
- *Calculating the perimeter of irregular objects*

3) Which of these content areas are taught in the second term, and what does this mean for your teaching?

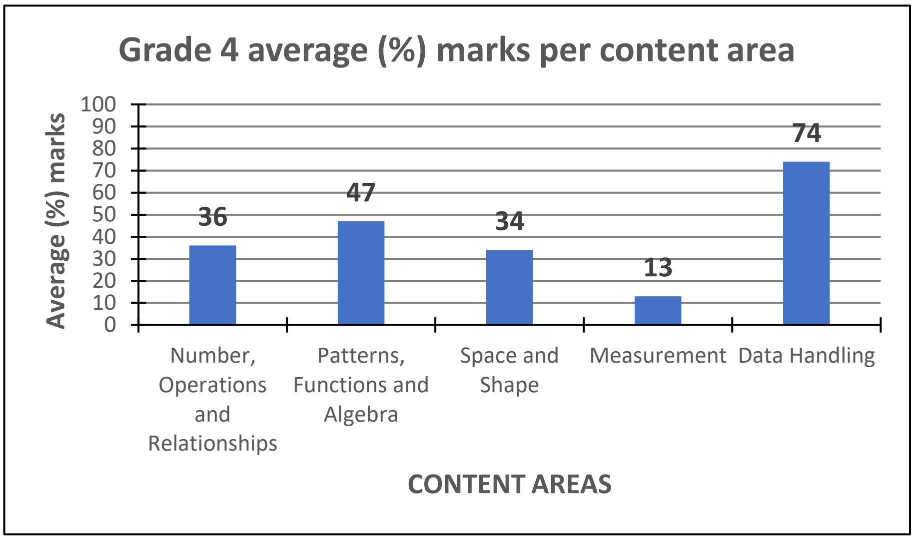
Conversions and Perimeter

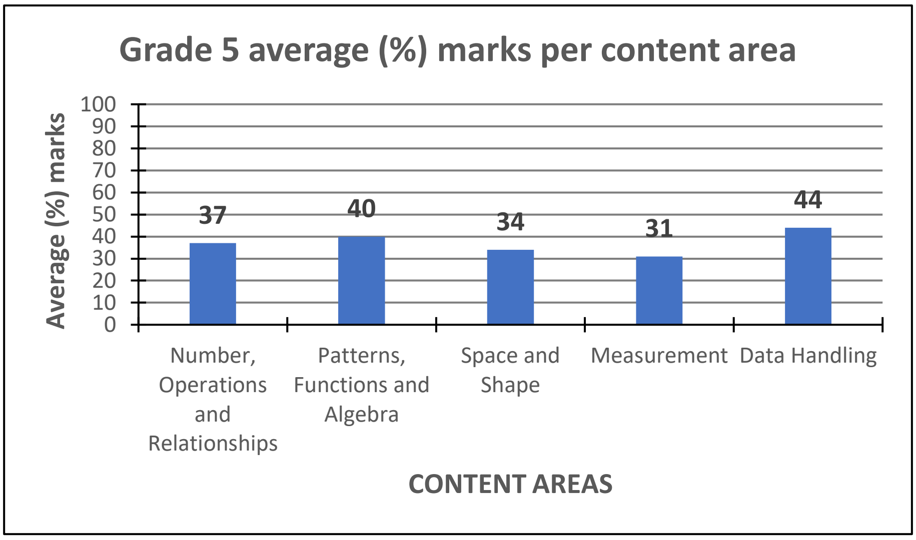
Care is going to have to be taken, especially when teaching these two topics.

Note to the Facilitator – hints are given in the next section for teaching conversions.

RESULTS OF THE 2014 ANAs

Taken from "The Annual National Assessment of 2014 Diagnostic Report, Intermediate and Senior Phases – Mathematics"





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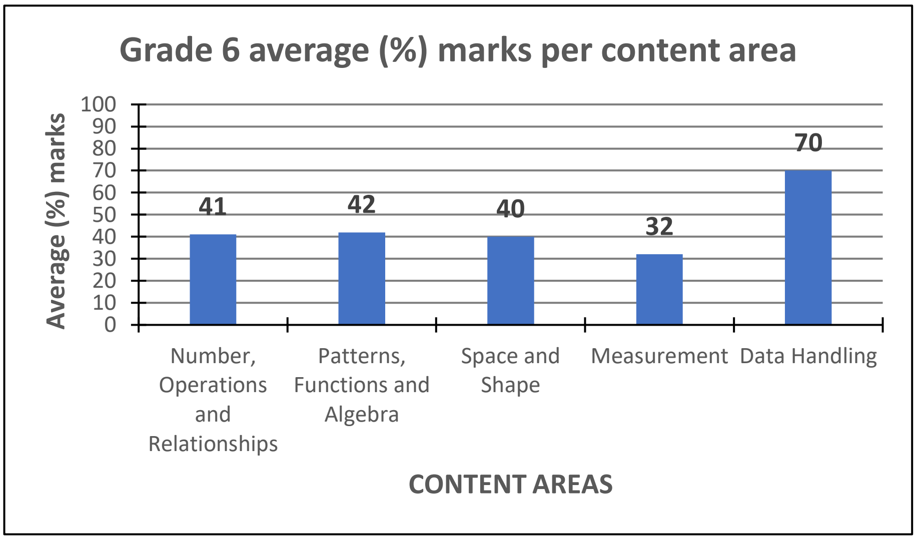


PTO…

RESULTS OF THE 2014 ANAs (continued)

<table>
<tr><th colspan="4">SUMMARY OF KNOWLEDGE AND SKILLS ASSESSED AS WELL AS AREAS OF WEAKNESS AND STRENGTH IN EACH GRADE</th></tr>
<tr><th>Grade</th><th>Knowledge and skills assessed</th><th>Areas of weakness</th><th>Area of strength</th></tr>
<tr><td>4</td><td rowspan="3">Learners had to demonstrate knowledge of and skills in calculating quantities such as mass, length, perimeter, temperature and volume of objects.

They were also assessed on ability to calculate time and show how to do conversions in expressing measurement in different forms.</td><td>Learner responses showed weaknesses in the following areas:
• Calculation of time intervals;
• Conversion of units in measurement</td><td>Questions on the following areas were reasonably well answered:
• Reading time on time instruments;</td></tr>
<tr><td>5</td><td>Learner responses showed weaknesses in the following areas:
• Calculation of time in hours and minutes;
• Arranging units of measurements from the least to the most;
• Calculating the perimeter of rectangular objects.</td><td>Questions on the following areas were reasonably well answered:
• Solving problems that involve temperature;</td></tr>
<tr><td>6</td><td>Learner responses showed weaknesses in the following areas:
• Time zone maps and calculating time;
• Conversions of units in measurement;</td><td>Questions on the following areas were reasonably well answered:
• Reading correct measurements from a scale</td></tr>
</table>

3.2: ASSISTING LEARNERS WITH CONVERSIONS. *(found on page 15 of the Participant's Handout)*

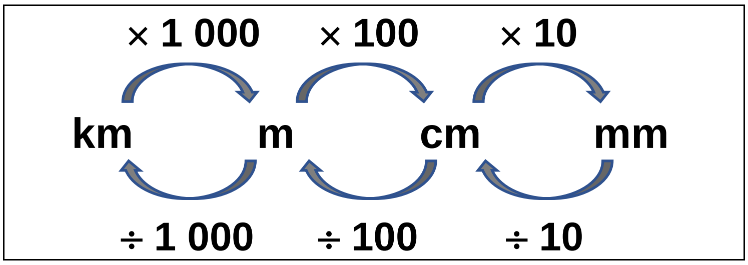
Time is taught in Term 1 in Grades 4, 5 and 6, so is not relevant here.

However, length (Grades 4 and 5), Capacity/volume (Grade 6) and Perimeter, Area, Volume and Surface Area (Grade 7) are taught in Term 2. This means that conversions are an important skill that has to be taught in Term 2.

The following diagrams are adapted from http://passyworldofmathematics.com/converting-metric-units/

Converting LENGTH Units

In the metric system, Length is based on the metre or m.

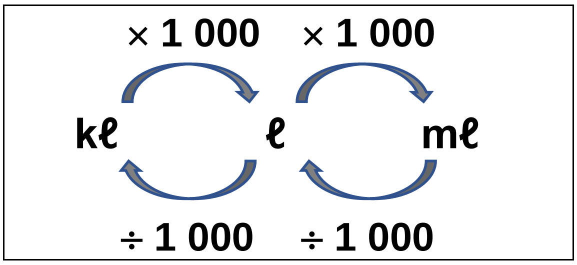


5 km = ? m
(need to × 1 000) So, 5 km = 5 × **1 000** m = 5 000 m

120 cm = ? m
(need to ÷ 100)   So, 120 cm = 120 ÷ **100 m** = 1,2 m

Converting CAPACITY Units

In the metric system, Capacity is based on the litre or ℓ.



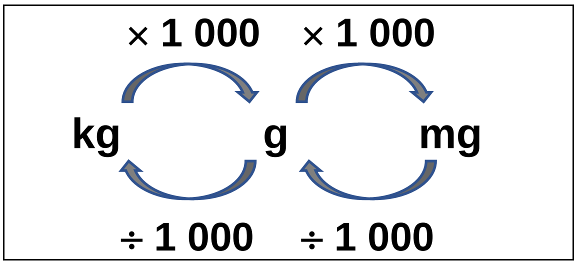
3 kℓ = ? ℓ
(need to × 1 000) So, 3 kℓ = 3 × 1 000 ℓ = 3 000 ℓ

625 mℓ = ? ℓ
(need to ÷ 1 000)   So, 625 mℓ = 625 ÷ 1 000 ℓ = 0,625 ℓ

The Inanda Dam has a capacity of 241 700 000 kℓ
This is the same as 241 700 000 × 1 000 ℓ = 241 700 000 000 ℓ of cold drink!
= 241 700 million ℓ of cold drink!
= 241,7 billion ℓ of cold drink!

Converting MASS Units

In the metric system, Mass is based on grams or g.



14 kg = ? g
(need to × 1 000) So, 14 kg = 14 × 1 000 g = 14 000 g

520 mg = ? g
(need to ÷ 1 000) So, 520 mg = 520 ÷ 1 000 g = 0,52 g

SUGGESTIONS

i) Make large copies of the three diagrams on pages 14 and 15 and put them up in your classroom.

ii) DON'T use diagrams like the two given to teach Area and Volume conversions. ALWAYS use the length conversions.

EXAMPLES:

a) Calculate the volume in m^3 of a rectangular prism that is 250 cm long, 75 cm wide and 10 cm high

Volume = 250 cm × 75 cm × 10 cm
= 2,5 m × 0,75 m × 0,1 m
= 0,1875 m^3

b) Convert 1,245 m^2 to mm^2

1,245 m^2 = 1,245 m × 1 m
= 1 245 mm × 1 000 mm
= 1 245 000 mm^2

3.3: ANSWERING TEACHER'S QUESTIONS ABOUT THE WORK COVERED IN TERM 2 *(found on page 17 of the Participant's Handout)*

Work with your group to answer these questions.

1) ***Teacher A*** says that she looked at the weighting of the content areas in CAPS and saw that only 10% of the final mark is allocated to Measurement, both in the Intermediate Phase and the Senior Phase. She asks whether it was necessary to waste time on teaching Measurement in Primary School.

WEIGHTING OF CONTENT AREAS

(Page 12 of Intermediate Phase CAPS and page 11 of Senior Phase CAPS)

Content Area	**Grade 4**	**Grade 5**	**Grade 6**	**Grade 7**	**Grade 8**	**Grade 9**
Numbers, Operations and Relationships	50%	50%	50%	30%	25%	15%
Patterns, Functions and Algebra	10%	10%	10%	25%	30%	35%
Space and Shape (Geometry)	15%	15%	15%	25%	25%	30%
Measurement	10%	10%	10%	10%	10%	10%
Data Handling	10%	10%	10%	10%	10%	10%

The weighting of Numbers, Operations and Relationships has been increased to 50% as an attempt to ensure that learners are sufficiently numerate when they enter the Senior Phase.

To prepare your answer to her, answer the following:

a) Besides Grade 4 to 9 Maths, which other Intermediate Phase and Senior Phase subjects use measurement facts?

Intermediate Phase: Natural Science and Technology; Social Science

Senior Phase: Natural Science, Social Science, Technology, EMS

b) Which FET subjects require learners to be able to do conversions, do measurement calculations and solve measurement problems?

Maths – especially Grade 12 Calculus

Maths Literacy

Physical Sciences; Geography; Life Sciences; Technical Subjects

Geography

c) So, how are you going to answer her?

2) ***Teacher B*** asks, before he starts teaching length in Grade 5, how can he find out whether the Grade 5s have remembered what they have learned about length in Grade 4. How would you answer him?

The Grade 5 learners repeat everything that is done in Grade 4.

Start off by doing a pre-test containing Grade 4 length questions. That will give you an idea if the class has any gaps in their knowledge. You can then focus on these gaps in Grade 5.

3) ***Teacher C*** asks, what she must do to address any gaps in the learners' measurement knowledge in Grade 4, Grade 5, Grade 6 and Grade 7?

Use the readings on the next two pages to help her with her problem.

As you discuss this with the teachers, make sure that:

- *They know what a learning gap is (page 19 in the Participant's Handout)*
- *They know how learning gaps happen (page 19)*
- *They know why learning gaps are a problem (page 19)*
- *They know how learning gaps should be addressed (page 19)*
- *They know when learning gaps close (page 19)*
- *They know how they can fill the gaps and teach the current work all in one year (page 20)*

Understanding Maths Learning Gaps

Adapted from http://www.mathnasium.com/littleton-news-understanding-math-learning-gaps

What is a learning gap?

A math learning gap refers to any math skill that a student should have previously mastered but didn't. Examples of learning gaps include a fifth grader who didn't learn what the numerator in a fraction means, or a tenth grader who doesn't know when the communitive property applies in algebra. It could be a fourth grade student who still uses ones as their primary method for adding and subtracting numbers (fingers, dots, tally marks, in their head).

How do learning gaps happen?

Learning gaps occur for all kinds of reasons. Some common factors that may contribute to learning gaps include:

- A child missed a lesson due to illness or family circumstances
- The teacher did not adequately cover the concept
- The math curriculum does not cover the concept in enough depth
- The pace of the math lesson was too fast
- The child learned to solve problems using an algorithm but lacks conceptual understanding
- The child felt sick or stressed while the concept was being taught and didn't retain the information
- A rudimentary understanding of the concept was achieved by the child but he or she didn't master the concept enough to understand how and when to apply it
- Outside factors are causing the child stress and so they cannot focus in class (divorce, bullying, overall lack of confidence or self-esteem, particularly in math)

Why are Learning Gaps a Problem?

Math skills build upon each other. Some skills are called foundational. Without mastering foundational skills, advancing in more difficult concepts becomes almost impossible. For example, a child who hasn't learned to count backward will struggle with subtraction.

How Should Learning Gaps be Addressed?

Effective instruction aimed at the missed or poorly understood concept and conducted at a pace suitable for each specific child is the best remedy for a learning gap. Students also need the opportunity to apply the concept in a variety of situations and to be able to ask questions to clear up any misunderstandings. Fixing a learning gap due to a conceptual misunderstanding takes time and practice.

When do Learning Gaps Close?

Learning gaps close when they are addressed. This can be a week or years after the learning should have occurred. The quicker a learning gap is addressed the less problems it will create, but it is never too late to close a learning gap.

For struggling learners, how do we fill their gaps and teach the current work all in one year?

Taken from: http://researchmap.digitalpromise.org/ask_a_researcher/struggling-learners-fill-gaps-teach-grade-level-one-year/

ANSWER: Keep filling gaps; teach current material separately
By Jon R. Star

This is a familiar challenge for many math teachers. Topics in mathematics are usually taught in a purposeful sequence, from topic A to topic B to topic C, etc. Ideally, students would master topic A before progressing to topic B, then topic B before progressing to topic C. But too often, students do not master those prerequisites. Due to time constraints and curricular expectations, teachers have to finish one unit and move on to the next before every student in the classroom has mastered the former. Unit by unit and year by year, this problem can snowball. Teachers then must cover the grade level material (for example, topic C) while at the same time filling in the gaps (for example, topics B and A).

While there is no easy solution to this challenging situation, my advice would be to keep these two goals — filling gaps and teaching current material — separate.

Devote instructional time daily to filling gaps. Expose students to mathematics problems that include tasks from prior years and units. You can do this through "do now" or warm-up exercises, additions to homework assignments, or even test problems. The point is to give students opportunities to revisit past content and to refine their understandings of this "old" material.

When it comes to the current material, recognize that it may be necessary (in the short term, at least) to modify the complexity of new content so that it's approachable for all students, especially those with a weaker knowledge of "old" material. Students will have an easier time learning new content if the assumption is not that each of them has a complete understanding of the prerequisite content. So, when presenting new material, consider using "easier" numbers, fewer fractions, and generally more straightforward problems. This way, struggling students can begin to grasp the important ideas of the new material without being handicapped by their fragile understanding of the "old."

Too often, struggling students fall further and further behind because their lack of understanding of prior content prevents them from learning new material. This is a very difficult cycle to break. But by devoting regular instructional time to reviewing and remediating past material, and by altering the ways that the new material is presented so that it's more approachable for struggling students, we can increase the chances that these students will gradually find a more stable foothold in math and begin the difficult climb back to full understanding.

3.4: WHAT ABOUT THE JUNE EXAMS? *(found on page 21 of the Participant's Handout)*

CAPS states that Formal Assessments should cater for a range of cognitive levels and abilities of the learners. It is important that all assessment (both informal and formal) contain questions that are not just Level 1 questions. Make sure that the June exams have questions at all four Cognitive Levels, in the approximate percentages as shown below.

The following table is a combination of the cognitive levels listed in the Intermediate Phase CAPS (page 296) and the Senior Phase CAPS (page 157).

Cognitive Levels	Description of skills to be demonstrated	Grade 4, 5 and 6 examples	Grade 7, 8, 9 examples
LEVEL 1 Knowledge (≈ 25%)	• Estimation and appropriate rounding of numbers • Straight recall • Identification and direct use of correct formula • Use of mathematical facts • Appropriate use of mathematical vocabulary	1. Write down the next three numbers in the sequence: 103; 105;107… **[Grade 4]** 2. Determine the factors of 64 **[Grade 5]** 3. Write down the prime numbers that are factors of 36 **[Grade 6]**	1. Estimate the answer and then calculate with a calculator: $\frac{62\ 816}{325+279}$ **[Grade 7]** 2. Use the formula $A = \pi r^2$ to calculate the area of a circle if the diameter is equal to 10 cm. **[Grade 8]** 3. Write down the y-intercept of the function $y = 2x + 1$ **[Grade 9]**
LEVEL 2 Routine procedures (≈ 45%)	• Perform well-known procedures • Simple applications and calculations which might involve many steps • Derivation from given information may be involved • Identification and use (after changing the subject) of correct formula generally similar to those encountered in class	1. Determine the value for x if $x + 4 = 10$ **[Grade 4]** 2. Use three different techniques of calculating 48 × 816 **[Grade 5]** 3. Calculate: $1\frac{1}{5} + \frac{3}{10} - \frac{1}{2}$ **[Grade 6]**	1. Determine the mean of five Grade 7 learners' marks if they have respectively achieved 25; 40; 21; 85; 14 out of 50. **[Grade 7]** 2. Solve for x in $x - 6 = 9$ **[Grade 8]** 3. R600 invested at r% per annum for a period of 3 years yields R150 interest. Calculate the value of r if $SI = \frac{P.n.r}{100}$ **[Grade 9]**
LEVEL 3 Complex procedures (≈ 20%)	• Problems involving complex calculations and/or higher order reasoning • Investigations to describe rules and relationships – there is often not an obvious route to the solution • Problems not necessarily based on a real-world context – could involve making significant connections between different representations • Problems require conceptual understanding	1. Peggy is 4 years old and Jock is 8 years old. Determine the ratio between their ages. Write the ratio in simplest fractional form. **[Grade 4]** 2. Investigate the properties of rectangles and squares to identify similarities and differences. **[Grade 5]** 3. There were 20 sweets in the packet. William and his friend ate $\frac{2}{5}$ of the sweets. How many sweets are left? **[Grade 6]**	1. Mr Mnisi pays R75 for a book which he marks up to provide 20% profit. He then sells it for cash at 4% discount. Calculate the selling price. **[Grade 7]** 2. A car travelling at a constant speed travels 60 km in 18 minutes. How far, travelling at the same constant speed, will the car travel in 1 hour 12 minutes? **[Grade 8]** 3. Use investigation skills to prove that the angles on a straight line are supplementary. **[Grade 9]**
LEVEL 4 Problem solving (≈ 10%)	• Unseen, non-routine problems (which are not necessarily difficult) • Higher order understanding and processes are often involved • Might require the ability to break the problem down into its constituent parts	1. The sum of three consecutive whole numbers is 27. Find the numbers. **[Grade 4]** 2. Heidi divided a certain number by 16. She found an answer of 246 with a remainder of 4. What is the number? **[Grade 5]** 3. Busi has a bag containing six coloured balls: 1 blue, 2 red ball and 3 yellow balls. She puts her hand in the bag and draws a ball. What is the chance that she will draw a red ball? Write the answer in simplest fractional form. **[Grade 6]**	1. The sum of three consecutive numbers is 87. Find the numbers. **[Grade 7]** 2. Mary travels a distance of x km in 6 hours if she travels at an average speed of 20 km/h on her bicycle. What should be her average speed if she wants to cover the same distance in 5 hours? **[Grade 8]** 3. The combined age of a father and son is 84 years old. In 6 years' time the father will be twice as old as the son was 3 years ago. How old are they now? **[Grade 9]**

Answer the following Measurement exam questions and then state each question's cognitive level.

Grade 4

(Formal Assessment Exemplar Term 2 Exam. Page 166 in Platinum Maths Grade 4)

Sipho has 4 m of string, Sasha has 390 cm of string and James has 5 250 mm of string.

a) Order these lengths from shortest to longest. (**Hint:** First write each length in centimetres)

4 m = 400 cm; 5 250 mm = 525 cm

Correct order: 390 cm; 400 cm; 525 cm ***RP***

b) What length of string (in centimetres) do they have altogether?

390 cm + 400 cm + 525 cm = 1 315 cm ***RP***

c) Write your answer to question b) in metres and round it off to the nearest metre.

1 315 cm = 13 m 15 cm ≈ 13 m ***RP***

Grade 5

(Formal Assessment Exemplar Term 2 Exam. Page 172 in Platinum Maths Grade 5)

John has 351 books. The average width of one book is 25 mm.

a) Estimate the total length of shelving that John will need for his books by rounding the numbers off to the nearest 10.

351×25 mm $\approx 350 \times 30$ mm = 10 500 mm ***PS***

b) Calculate the total length of shelving that John will need. Round your answer off to the nearest centimetre.

351×25 mm = 8 775 mm = 877,5 cm ≈ 878 cm ***CP***

Grade 6

(Formal Assessment Exemplar Term 2 Exam. Page 174 in Platinum Maths Grade 6)

1. Convert the following capacities to millilitres:

   a) 6 ℓ 89 mℓ

   6 089 mℓ ***K***

   b) 0,3 ℓ

   300 mℓ ***K***

2. Convert the following capacities to litres:

   a) 4 ℓ 580 mℓ

   4,580 ℓ ***K***

   b) 600 mℓ

   0,6 ℓ ***K***

3. Solve the following word problems:

   a) How much more than 425 mℓ is 1,5 ℓ?

   1,5 ℓ – 425 ml = 1,5 ℓ – 0,425 ℓ = 1,075 ℓ ***CP***

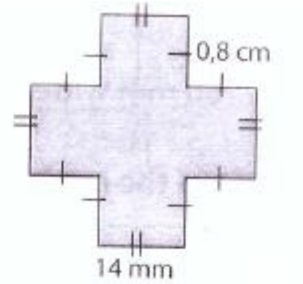
   OR 1,5 ℓ - 425 mℓ = 1 500 mℓ - 425 mℓ = 1 075 mℓ

   b) How many 220 mℓ glasses of milk can you fill from a 5,5 ℓ container?

   $\frac{5,5\ l}{220\ ml} = \frac{5\ 500\ ml}{220\ ml}$ = 25 glasses CP

Grade 7

(Formal Assessment Exemplar Exam Practice. Pages 138 and 139 in Platinum Maths Grade 5)



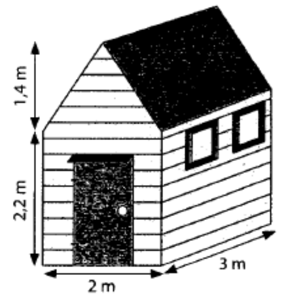
1. Find the perimeter of the figure and give your answer in centimetres:

Perimeter $= 4 \times 14\ mm + 8 \times 0{,}8\ cm$

$= 4 \times 1{,}4\ cm + 8 \times 0{,}8\ cm = 5{,}6\ cm + 6{,}4\ cm = 12\ cm$ ***CP***

2. If the perimeter of a square is 212 cm, what is the length of one side?

Length of one side $= \frac{212\ cm}{4} = 53\ cm$ ***RP***



Zakele's shed.

3. Zakele measured the windows and door of a garden shed. He found that they have a total area of $2{,}5\ m^2$. He wants to paint the outside walls of the shed.
   a) Calculate the total area of the walls.
   b) 1 litre of paint covers $8\ m^2$. Calculate how many litres of paint Zakele will need.

a) *The shed has 4 walls. Two are rectangular with dimensions of* $3\ m \times 2{,}2\ m$. *Two walls are made up of a rectangle and a triangle with dimensions* $(2\ m \times 2{,}2\ m) + \left(\frac{1}{2} \times 2\ m \times 1.4\ m\right)$.
The area of all the windows and the door $= 2{,}5\ m^2$.
Total area of walls $= 2 \times (3\ m \times 2{,}2\ m) + 2 \times [(2 \times 2{,}2) + \left(\frac{1}{2} \times 2\ m \times 1{,}4\ m\right)] - 2{,}5\ m^2$

$= 13{,}2\ m^2 + 2 \times (4{,}4\ m^2 + 1{,}4 m^2) - 2{,}5\ m^2$

$= 13{,}2\ m^2 + 11{,}6\ m^2 - 2{,}5\ m^2$

$= 22{,}3\ m^2$ ***PS***

b) $8\ m^2$ *of wall is covered by* $1\ \ell$ *of paint*

$1\ m^2$ *of wall is covered by* $\frac{1}{8}\ \ell$ *of paint*

$22{,}3\ m^2$ *of wall is covered by* $22{,}3 \times \frac{1}{8} = 2{,}7875\ \ell$ *of paint* ***CP***

3.5: CONCLUSION *(found on page 25 of the Participant's Handout)*

What have you learned in this JiT Training Workshop??

What would you like to be covered in the 2nd JiT Training Workshop?

Resources

The following resources come from CAP Mathematics Intermediate Phase Grades 4-6 and CAPS Mathematics Senior Phase Grades 7-9 *(pages 26 to 37 of the Participant's Handout)*

MATHEMATICS GRADES 4-6

TIME ALLOCATION PER TOPIC: GRADE 4							
Term 1		**Term 2**		**Term 3**		**Term 4**	
Topic	**Time**	**Topic**	**Time**	**Topic**	**Time**	**Topic**	**Time**
Mental Mathematics (10 minutes daily)	**8 hours**	Mental Mathematics (10 minutes daily)	**7 hours**	Mental Mathematics (10 minutes daily)	**8 hours**	Mental Mathematics (10 minutes daily)	**7 hours**
Whole numbers: counting, ordering, comparing, representing and place value (3-digit numbers)	**2 hours**	Whole numbers: counting, ordering, comparing, representing and place value (4-digit numbers)	**1 hour**	Capacity/volume	**6 hours**	Whole numbers: counting, ordering, comparing, representing and place value (4-digit numbers)	**1 hour**
Number sentences	**3 hours**	Whole numbers: addition and subtraction (4-digit numbers)	**4 hours**	Common fractions	**5 hours**	Whole numbers: addition and subtraction (4-digit numbers)	**4 hours**
Whole numbers: addition and subtraction (3-digit numbers)	**8 hours**	Common fractions	**6 hours**	Whole numbers: counting, ordering, comparing, representing and place value (4-digit numbers)	**1 hour**	Mass	**6 hours**
Numeric patterns	**4 hours**	Length	**7 hours**	Whole numbers: addition and subtraction (4-digit numbers)	**4 hours**	Properties of 3-D objects	**4 hours**
Whole numbers: multiplication and division (1-digit by 1 digit)	**4 hours**	Whole number: multiplication (2-digit by 2-digit)	**6 hours**	Viewing objects	**2 hours**	Common fractions	**5 hours**
Time	**6 hours**	Properties of 3-D objects	**5 hours**	Properties of 2-D shapes	**4 hours**	Whole numbers: dvision (3-digit by 1-digit)	**3 hours**
Data handling	**10 hours**	Geometric patterns	**4 hours**	Data handling	**7 hours**	Perimeter , area & volume	**7 hours**
Properties of 2-D shapes	**5 hours**	Symmetry	**2 hours**	Numeric patterns	**4 hours**	Position and movement	**2 hours**
Whole numbers: multiplication and division (2-digit by 1- digit)	**5 hours**	Whole numbers: addition and subtraction (4-digit numbers)	**4 hours**	Whole numbers: addition and subtraction (4-digit numbers)	**4 hours**	Transformations	**3 hours**
		Whole numbers: division (3-digit by 1- digit)	**4 hours**	Whole numbers: multiplication (2-digit by 2-digit)	**5 hours**	Geometric patterns	**2 hours**
				Number sentences	**3 hours**	Whole numbers: addition and subtraction (4-digit numbers)	**3 hours**
				Transformations	**3 hours**	Probability	**2 hours**
Revision	**5 hours**	Revision	**4 hours**	Revision	**4 hours**	Revision	**5 hours**
		Assessment (all subjects)	**6 hours**			Assessment (all subjects)	**6 hours**
Total: 60 hours		**Total: 60 hours**		**Total: 60 hours**		**Total: 60 hours**	

TIME ALLOCATION PER TOPIC: GRADE 5							
Term 1		Term 2		Term 3		Term 4	
Topic	Time	Topic	Time	Topic	Time	Topic	Time
Mental Mathematics (10 minutes daily)	8 hours	Mental Mathematics (10 minutes daily)	7 hours	Mental Mathematics (10 minutes daily)	8 hours	Mental Mathematics (10 minutes daily)	7 hours
Whole numbers: counting, ordering, comparing, representing and place value (4-digit numbers)	2 hours	Whole numbers: counting, ordering, comparing, representing and place value (6-digit numbers)	1 hour	Common fractions	5 hours	Whole numbers: counting, ordering, comparing, representing and place value (6-digit numbers)	1 hour
Number sentences	3 hours	Whole numbers: addition and subtraction (5-digit numbers)	5 hours	Mass	5 hours	Whole numbers: addition and subtraction (5-digit numbers)	5 hours
Whole numbers: addition and subtraction (5-digit numbers)	5 hours	Common fractions	5 hours	Whole numbers: counting, ordering, comparing, representing and place value (6-digit numbers)	1 hour	Properties of 3-D objects	5 hours
Numeric patterns	4 hours	Length	6 hours	Whole numbers: addition and subtraction	5 hours	Common fractions	5 hours
Whole numbers: multiplication (2-digit by 2-digit) and division (3-digit by 1-digit)	6 hours	Whole numbers: multiplication (3-digit by 2- digit)	7 hours	Viewing objects	3 hours	Whole numbers: division (3-digit by 2-digit)	7 hours
Time	6 hours	Properties of 3-D objects	6 hours	Properties of 2-D objects	4 hours	Area, perimeter & volume	7 hours
Data handling	10 hours	Geometric patterns	4 hours	Transformations	3 hours	Position and movement	2 hours
Properties of 2-D shapes	7 hours	Symmetry	2 hours	Temperature	2 hours	Transformations	4 hours
Capacity/volume	5 hours	Whole numbers: division (4-digit by 2 digit)	8 hours	Data handling	9 hours	Geometric patterns	2 hours
				Numeric patterns	5 hours	Number sentences	3 hours
				Whole numbers: multiplication (3-digit by 2- digit)	7 hours	Probability	2 hours
Revision	4 hours	Revision	3 hours	Revision	3 hours	Revision	4 hours
		Assessment (all subjects)	6 hours			Assessment (all subjects)	6 hours
TOTAL: 60 HOURS		TOTAL: 60 HOURS		TOTAL: 60 HOURS		TOTAL: 60 HOURS	

TIME ALLOCATION PER TOPIC: GRADE 6							
Term 1		Term 2		Term 3		Term 4	
Topic	Time	Topic	Time	Topic	Time	Topic	Time
Mental Mathematics (10 minutes daily)	8 hours	Mental Mathematics (10 minutes daily)	7 hours	Mental Mathematics (10 minutes daily)	8 hours	Mental Mathematics (10 minutes daily)	7hours
Whole numbers: counting, ordering, comparing, representing and place value (6-digit numbers)	2 hours	Whole numbers: counting, ordering, comparing, representing and place value (9-digit numbers)	1 hour	Mass	5 hours	Whole numbers: Counting, ordering, comparing, representing and place value (9-digit numbers)	1 hour
Number sentences	3 hours	Whole numbers: multiplication (4-digit by 2- digit)	5 hours	Whole numbers: counting, ordering, comparing, representing and place value (9-digit numbers)	1 hour	Whole numbers: Multiplication (4-digit by 3-digit)	5 hours
Whole numbers: addition and subtraction (5-digit numbers)	7 hours	Properties of 3-D objects	5 hours	Whole numbers: addition and subtraction (6-digit numbers)	8 hours	Common fractions	5 hours
Common fractions	10 hours	Geometric patterns	6 hours	Viewing objects	3 hours	Properties of 3-D objects	5 hours
Time	4 hours	Symmetry	2 hours	Properties of 2-D shapes	4 hours	Area, perimeter & volume	7 hours
Properties of 2-D shapes	8 hours	Whole numbers: division (4-digit by 2-digit)	8 hours	Transformations	3 hours	History	1 hour
Data handling	10 hours	Decimal fractions	10 hours	Temperature	1 hour	Whole numbers: Division (4-digit by 3-digit)	7 hours
Numeric patterns	4 hours	Capacity/volume	5 hours	Percentages	5 hours	Number sentences	3 hours
				Data handling	9 hours	Transformations	3 hours
				Numeric patterns	5 hours	Position and movement	2 hours
				Length	5 hours	Probability	2 hours
Revision	4 hours	Revision	5 hours	Revision	3 hours	Revision	6 hours
		Assessment (all subjects)	6 hours			Assessment (all subjects)	6 hours
TOTAL: 60 HOURS		TOTAL: 60 HOURS		TOTAL: 60 HOURS		TOTAL: 60 HOURS	

TIME ALLOCATION PER TOPIC: GRADE 7							
TERM 1		**TERM 2**		**TERM 3**		**TERM 4**	
Topic	**Time**	**Topic**	**Time**	**Topic**	**Time**	**Topic**	**Time**
Whole numbers	**9 hours**	Common fractions	**9 hours**	Numeric and geometric patterns	**6 hours**	Integers	**9 hours**
Exponents	**9 hours**	Decimal fractions	**9 hours**	Functions and relationships	**3 hours**	Numeric and geometric patterns	**3 hours**
Construction of Geometric figures	**10 hours**	Functions and relationships	**3 hours**	Algebraic expressions	**3 hours**	Functions and relationships	**3 hours**
Geometry of 2D shapes	**10 hours**	Area and perimeter of 2D shapes	**7 hours**	Algebraic equations	**3 hours**	Algebraic expressions	**3 hours**
Geometry of straight lines	**2 hours**	Surface area and Volume of 3D objects	**8 hours**	Graphs	**6 hours**	Algebraic equations	**4 hours**
				Transformation geometry	**9 hours**	Collect, organize and summarize data	**4 hours**
				Geometry of 3D objects	**9 hours**	Represent data	**3 hours**
						Interpret, analyse and report data	**3,5 hours**
						Probability	**4,5 hours**
Revision/ assessment	**5 hours**	**Revision/ assessment**	**9 hours**	**Revision/ assessment**	**6 hours**	**Revision/ assessment**	**8hours**
TOTAL: 45 hours		**TOTAL: 45 hours**		**TOTAL: 45 hours**		**TOTAL: 45 hours**	

SPECIFICATION OF CONTENT (PHASE OVERVIEW)

MEASUREMENT

- The main progression in measurement across the grades is achieved by
  - the introduction of new measuring units, particularly in Grades 4 and 6.
  - the increase in number range and complexity of calculations that learners are able to do in each grade
- Practical measuring using measuring instruments is central to measurement in this phase.
- In the sequencing of measurement topics within each grade, cognizance should be taken of the number work that has already been covered in that year, particularly with regard to calculations and solving problems.

TOPICS	GRADE 4	GRADE 5	GRADE 6
4.1 **Length**	**Practical measuring** of 2-D shapes and 3-D objects by • estimating • measuring • recording • comparing and ordering **Measuring instruments:** rulers, metre sticks, tape measures, trundle wheels **Units:** millimetres (mm), centimetres (cm), metres (m), kilometres (km) **Calculations and problem-solving involving length** • Solve problems in contexts involving length • Conversions include converting between - millimetres (mm), and centimetres (cm) - centimetres (cm) and metres (m) - metres (m) and kilometres (km) • Conversions limited to whole numbers and common fractions	**Practical measuring** of 2-D shapes and 3-D objects by • estimating • measuring • recording • comparing and ordering **Measuring instruments:** rulers, metre sticks, tape measures, trundle wheels **Units:** millimetres (mm), centimetres (cm), metres (m), kilometres (km) **Calculations and problem-solving involving length** • Solve problems in contexts involving length • Conversions include converting between any of the following units: - millimetres (mm) - centimetres (cm) - metres (m) - kilometres (km) • Conversions limited to whole numbers and common fractions	**Practical measuring** of 2-D shapes and 3-D objects by • estimating • measuring • recording • comparing and ordering **Measuring instruments:** rulers, metre sticks, tape measures, trundle wheels **Units:** millimetres (mm), centimetres (cm), metres (m), kilometres (km) • **Calculations and problem-solving involving length** • Solve problems in contexts involving length • Conversions include converting between any of the following units: - millimetres (mm) - centimetres (cm) - metres (m) - kilometres (km) • Conversions should include common fraction and decimal fractions to 2 decimal places

TOPICS	GRADE 4	GRADE 5	GRADE 6
4.2 **Mass**	**Practical measuring** of 3-D objects by • estimating • measuring • recording • comparing and ordering **Measuring instruments:** bathroom scales, kitchen scales and balances **Units:** grams (g) and kilograms (kg); **Calculations and problem-solving involving mass include:** • problems in contexts involving mass • converting between grams and kilograms limited to examples with whole numbers and fractions	**Practical measuring** of 3-D objects by • estimating • measuring • recording • comparing and ordering **Measuring instruments:** bathroom scales, kitchen scales and balances **Units:** grams (g) and kilograms (kg); **Calculations and problem-solving involving mass include:** • problems in contexts involving mass • converting between grams and kilograms limited to examples with whole numbers and fractions	**Practical measuring** of 3-D objects by • estimating • measuring • recording • comparing and ordering **Measuring instruments:** bathroom scales (analogue and digital); , kitchen scales (analogue and digital) and balances **Units:** grams (g) and kilograms (kg); **Calculations and problem-solving involving mass include:** • problems in contexts involving mass • converting between grams and kilograms • conversions should include fraction and decimal forms (to 2 decimal places)
4.3 **Capacity/Volume**	**Practical measuring** of 3-D objects by • estimating • measuring • recording • comparing and ordering **Measuring instruments:** measuring spoons, measuring cups, measuring jugs **Units:** millilitres (*ml*) , litres (*l*) **Calculations and problem solving involving capacity/volume include:** • problems in contexts involving capacity/volume • converting between litres and millilitres limited to examples with whole numbers and fractions	**Practical measuring** of 3-D objects by • estimating • measuring • recording • comparing and ordering **Measuring instruments:** measuring spoons, measuring cups, measuring jugs **Units:** millilitres (*ml*) , litres (*l*) **Calculations and problem solving involving capacity/volume include:** • problems in contexts involving capacity/volume • converting between litres and millilitres limited to examples with whole numbers and fractions	**Practical measuring** of 3-D objects by • estimating • measuring • recording • comparing and ordering **Measuring instruments:** measuring jugs **Units:** millilitres (*ml*), litres (*l*) and kilolitres (*kl*) **Calculations and problem solving involving capacity/volume include:** • problems in contexts involving capacity/volume • converting between kilolitres, litres and millilitres - conversions should include fraction and decimal forms (to 2 decimal places)

TOPICS	GRADE 4	GRADE 5	GRADE 6
4.4 Time	**Reading time and time instruments** • Read, tell and write time in 12-hour and 24-hour formats on both analogue and digital instruments in - hours - minutes - seconds • Instruments include clocks and watches **Reading calendars** **Calculations and problem solving time include** • problems in contexts involving time • calculation of the number of days between any two dates within the same or consecutive years • calculation of time intervals where time is given in minutes or hours only **History of time** Know some ways in which time was measured and represented in the past	**Reading time and time instruments** • Read, tell and write time in 12-hour and 24-hour formats on both analogue and digital instruments in - hours - minutes - seconds • Instruments include clocks, watches and stopwatches **Reading calendars** **Calculations and problem solving time include** • problems in contexts involving time • calculation of time intervals where time is given in - seconds and/or minutes - minutes and/or hours - hours and/or days - days, weeks and/or months - years and/or decades **History of time** Know some ways in which time was measured and represented in the past	**Reading time and time instruments** • Read, tell and write time in 12-hour and 24-hour formats on both analogue and digital instruments in - hours - minutes - seconds • Instruments include clocks, watches and stopwatches **Reading calendars** **Calculations and problem solving time include** • problems in contexts involving time • reading time zone maps and calculating time differences based on time zones • calculation of time intervals where time is given in - seconds and/or minutes - minutes and/or hours - hours and/or days - days, weeks and/or months - years and/or decades - centuries, decades and/or years **History of time** Know some ways in which time was measured and represented in the past.

TOPICS	GRADE 4	GRADE 5	GRADE 6
4.5 Temperature		**Practical measuring of temperature by** • estimating • measuring • recording • comparing and ordering **Measuring instruments:** • thermometers **Units:** • degrees Celsius **Calculations and problem-solving related to temperature include:** • problems in contexts related to temperatures • calculating temperature differences limited to positive whole numbers	**Practical measuring of temperature by** • estimating • measuring • recording • comparing and ordering **Measuring instruments:** • thermometers (analogue and digital) **Units:** • degrees Celsius **Calculations and problem-solving related to temperature include:** • problems in contexts related to temperatures • calculating temperature differences limited to positive whole numbers
4.6 **Perimeter, surface area and volume**	**Perimeter** Measure perimeter using rulers or measuring tapes **Measurement of area** • Find areas of regular and irregular shapes by counting squares on grids in order to develop an understanding of square units **Measurement of volume** • Find volume/capacity of objects by packing or filling them in order to develop an understanding of cubic units	**Perimeter** Measure perimeter using rulers or measuring tapes **Measurement of area** • Find areas of regular and irregular shapes by counting squares on grids in order to develop an understanding of square units **Measurement of volume** • Find volume/capacity of objects by packing or filling them in order to develop an understanding of cubic units	**Perimeter** Measure perimeter using rulers or measuring tapes **Measurement of area** • Continue to find areas of regular and irregular shapes by counting squares on grids • Develop rules for calculating the areas of squares and rectangles **Measurement of volume** • Continue to find volume/capacity of objects by packing or filling them • Develop an understanding of why the volume of rectangular prisms is given by length multiplied by width multiplied by height Investigate • Relationship between perimeter and area of rectangles and squares. • Relationship between surface area and volume of rectangular prisms

SPECIFICATION OF CONTENT (PHASE OVERVIEW)

MEASUREMENT

- Progression in Measurement is achieved by the selection of shapes and objects in each grade for which the formulae for finding area, perimeter, surface area and volume become more complex.
- The use of formulae in this phase provides a useful context to practise solving equations.
- The introduction of the Theorem of Pythagoras is a way of introducing a formula to calculate the lengths of sides in right-angled triangles. Hence, the Theorem of Pythagoras becomes a useful tool when learners solve geometric problems involving right-angled triangles.
- Measurement disappears as a separate topic in the FET phase, and becomes part of the study of Geometry and Trigonometry.

CONTENT	GRADE 7	GRADE 8	GRADE 9
4.1 **Area and perimeter of 2D shapes**	**Area and perimeter** • Calculate the perimeter of regular and irregular polygons • Use appropriate formulae to calculate perimeter and area of: - squares - rectangles - triangles **Calculations and solving problems** • Solve problems involving perimeter and area of polygons • Calculate to at least 1 decimal place • Use and convert between appropriate SI units, including: - $mm^2 \leftrightarrow cm^2$ - $cm^2 \leftrightarrow m^2$	**Area and perimeter** • Use appropriate formulae to calculate perimeter and area of: - squares - rectangles - triangles - circles • Calculate the areas of polygons, to at least 2 decimal places, by decomposing them into rectangles and/or triangles • Use and describe the relationship between the radius, diameter and circumference of a circle in calculations • Use and describe the relationship between the radius and area of a circle in calculations **Calculations and solving problems** • Solve problems, with or without a calculator, involving perimeter and area of polygons and circles • Calculate to at least 2 decimal places • Use and describe the meaning of the irrational number **Pi** (π) in calculations involving circles • Use and convert between appropriate SI units, including: $mm^2 \leftrightarrow cm^2 \leftrightarrow m^2 \leftrightarrow km^2$	**Area and perimeter** • Use appropriate formulae and conversions between SI units, to solve problems and calculate perimeter and area of: - polygons - circles • Investigate how doubling any or all of the dimensions of a 2D figure affects its perimeter and its area

CONTENT	GRADE 7	GRADE 8	GRADE 9
4.2 **Surface area and volume of 3D objects**	**Surface area and volume** • Use appropriate formulae to calculate the surface area, volume and capacity of: - cubes - rectangular prisms • Describe the interrelationship between surface area and volume of the objects mentioned above **Calculations and solving problems** • Solve problems involving surface area, volume and capacity • Use and convert between appropriate SI units, including: - $mm^2 \leftrightarrow cm^2$ - $cm^2 \leftrightarrow m^2$ - $mm^3 \leftrightarrow cm^3$ - $cm^3 \leftrightarrow m^3$ • Use equivalence between units when solving problems: - 1 $cm^3 \leftrightarrow$ 1 ml - 1 $m^3 \leftrightarrow$ 1 kl	**Surface area and volume** • Use appropriate formulae to calculate the surface area, volume and capacity of: - cubes - rectangular prisms - triangular prisms • Describe the interrelationship between surface area and volume of the objects mentioned above **Calculations and solving problems** • Solve problems, with or without a calculator, involving surface area, volume and capacity • Use and convert between appropriate SI units, including: - $mm^2 \leftrightarrow cm^2 \leftrightarrow m^2 \leftrightarrow km^2$ - $mm^3 \leftrightarrow cm^3 \leftrightarrow m^3$ - $ml\,(cm^3) \leftrightarrow l \leftrightarrow kl$	**Surface area and volume** • Use appropriate formulae and conversions between SI units to solve problems and calculate the surface area, volume and capacity of: - cubes - rectangular prisms - triangular prisms - cylinders • Investigate how doubling any or all the dimensions of right prisms and cylinders affects their volume
4.3 **The Theorem of Pythagoras**		**Develop and use the Theorem of Pythagoras** • Investigate the relationship between the lengths of the sides of a right-angled triangle to develop the Theorem of Pythagoras • Determine whether a triangle is a right-angled triangle or not if the length of the three sides of the triangle are known • Use the Theorem of Pythagoras to calculate a missing length in a right-angled triangle, leaving irrational answers in surd form	**Solve problems using the Theorem of Pythagoras** • Use the Theorem of Pythagoras to solve problems involving unknown lengths in geometric figures that contain right-angled triangles

SOME INTERNET RESOURCES TO HELP YOU WITH TEACHING GRADES 4 TO 7

List of Ontario Resources: http://www.edugains.ca/newsite/math/guides_effective_instruction.html [accessed 27 Feb 2018]

Grades 4 to 6:
- The Big Ideas: https://thelearningexchange.ca/wp-content/uploads/2017/01/Number-Sense-and-Numeration-Vol-1-Big-Ideas-4-6.pdf
- Addition and subtraction: https://thelearningexchange.ca/wp-content/uploads/2017/01/Number-Sense-and-Numeration-Vol-2-Addition-Subtraction-4-6.pdf
- Multiplication: http://www.eworkshop.on.ca/edu/resources/guides/NSN_vol_3_Multiplication.pdf
- Division: http://www.eworkshop.on.ca/edu/resources/guides/NSN_vol_4_Division.pdf
- Fractions: http://eworkshop.on.ca/edu/resources/guides/NSN_vol_5_Fractions.pdf
- Decimals: http://www.eworkshop.on.ca/edu/resources/guides/NSN_vol_6_Decimal_Numbers.pdf
- Measurement: http://www.eworkshop.on.ca/edu/resources/guides/Guide_Measurement_456.pdf
- Space and Shape: http://www.eworkshop.on.ca/edu/resources/guides/Guide_Geometry_Spatial_Sense_456.pdf
- Patterning and Algebra: http://eworkshop.on.ca/edu/resources/guides/Guide_Patterning_and_Algebra_456.pdf
- Data Handling and Probability: http://www.eworkshop.on.ca/edu/resources/guides/Guide_Data_Management_Probability_456.pdf
- Maths Resources: https://ontariomathresources.ca/math-strands/number-sense-and-numeration/