7

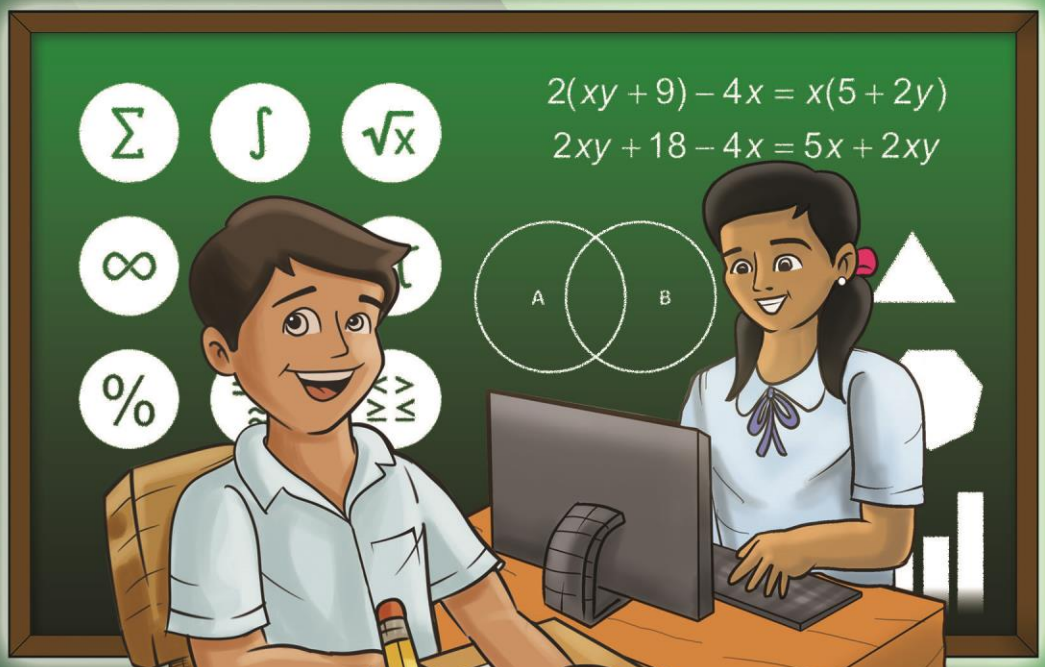
NATIONAL LEARNING CAMP

DepED DEPARTMENT OF EDUCATION

Mathematics

Enhancement Learning Camp

Lesson Plans



Enhancement Learning Camp
Lesson Plans Booklet

Mathematics Grade 7

Weeks 1 to 3

Contents

Dear Reader,

Every care has been taken to ensure the accuracy of the information provided in this Booklet. Nevertheless, if you identify a mistake, error, or issue, or wish to provide a comment, we would appreciate you informing the **Office of the Director of the Bureau of Learning Delivery** via telephone numbers (02) 8637-4346 and 8637-4347 or by email at bld.od@deped.gov.ph

Thank you for your support.

National Learning Camp Overview

Overview

The National Learning Camp (NLC) aims to enhance student and teacher learning through interactive lessons based on prior educational content. The program focuses on consolidating student knowledge, updating and expanding teacher expertise, and applying research-based strategies to improve learning teaching outcomes.

The NLC offers grade-level review lessons that are directed by the teacher and designed to be highly interactive among:

(i) students with their teacher; and
(ii) students with their peers.

The Camp lessons are grounded in the 'Science of Learning' framework, focusing on cognitive research and practical applications to enhance learning outcomes. Lessons are structured to reinforce foundational knowledge and skills, involve real-world problem-solving activities, and encourage higher-order thinking. The Camps also offer teachers opportunities for reflection and professional growth, encouraging the adoption of new teaching approaches and the extension of student learning through systematic review and application of knowledge.

Design Basis

A strength of the design is the focus on both student and teacher learning. The intentions and expectations of the NLC are for:

- students to consolidate and enhance their thinking in topics already covered;
- teachers to update, strengthen and expand their subject knowledge in ways that encourage students to be involved in learning activities at different levels including those considered as higher order; and
- teachers to enhance their pedagogical practices by focusing on selected skills, which include 21st century skills.

Under the framework of 'Science of Learning', research-evidence is used to ground teaching and learning decisions around cognition research and features of a learning brain such as working memory demands, cognitive load, valuing errors, and domain specific skills. This framework highlights a *learning-focused approach* where teachers go beyond what might be considered current practice in the Philippines and incorporate brain-based ideas and approaches, including 21st Century skills, to make teaching more effective in enhancing learning for all.

To further support this direction, teachers are provided with resources, time and the opportunity to further extend their skills, knowledge and understandings of teaching and how students learn. The review lessons are designed to apply subject content already encountered by students. Because of this, lessons do not contain repetitive, routine questions of a particular subject aspect.

Review lessons

The review lessons are based on content already encountered by students in their current grade. All lessons *involve an exploration of ideas, concepts and content*. The purpose of the review lessons is two-fold:

(i) to establish in students a stronger basis for future learning development (prior to enrolling in a new Grade after the summer break); and

(ii) to enable teachers to strengthen and enrich their teaching practice in a research-based, learning-focused professional program (prior to a new academic year).

The primary focus of the review lessons concerns revising, clarifying and then applying previously-taught subject content with real-world problem-solving and/or comprehension activities. Each lesson begins by a focused content review and clarification of material needed in the lesson to come. For students, this initial review enables them to practice retrieving and practicing important basics relevant to the lesson to come.

For Teachers, this information is designed to help determine learners' subject background knowledge and skills relevant to the lesson as well as help teachers identify where to build on previous learning. This approach is different to 'teaching' students anew as if they have not been taught previously.

Lesson Overview

All lessons in each of the three subjects, English, Mathematics and Science, contain five components. These are 1. Short Review, 2. Purpose/Intention, 3 Language Practice, 4 Activity and 5 Conclusion.

Timing

Approximate component timings are indicated as advice to guide the teacher in pacing the lessons. Time management involves:

- moving through components at a pace that is appropriate for learners;
- ensuring that all components are completed in a timely, efficient and constructive manner.

Research on student-learning quality and 'time' are related through student 'time-on-task'. Time-on-task refers to when students are actively involved (engaged) in some aspect of the learning process. The suggested times for each component are intended to maximize the time available for student involvement. This will encourage the student and teacher to work efficiently, timewise, through the lesson without jeopardizing the importance of student activities such as to:

- answer routine and non-routine questions,
- respond to verbal questions and explanations,
- interpret and use appropriate terminology,
- discuss aspects with their peers,
- explain or justify his/her approaches and thinking,
- work productively on their own, and
- listen carefully to the teacher or peers.

Establishing what is on-task time is more problematic when the teacher talks and students passively listen, such as in didactic teaching. With such an approach it is difficult to determine whether students are listening or even paying attention. Often in lessons identifying time-on task can also be problematic in case of problem-solving or intense reading and comprehension. Here, student activity is often more subtle and cerebral as students need to think quietly by themselves.

Ultimately, however, the time allocated to components will be determined by learners' needs and strengths, but not completely. They need to have practical limits on the duration of the components to prevent major disruption to lessons which can have a detrimental impact on student learning. Often, teacher should not expect too much learning to occur on an initial meeting of unfamiliar content. It is repeated exposure associated with elaboration, addressing errors, and deliberately practicing key aspects where most learning occurs.

When times are allocated appropriately, and students become familiar with the approach and teacher expectations, concept development and student skill levels are improved as well as student engagement.

Note: Care needs to be exercised in determining what engagement means. Engagement is clearer when **students are doing the learning** through answering questions, writing, discussing and reading.

Key Ideas and Questioning

Critical aspects of the NLC for the teacher include questions related to learning areas, based around a *key idea*. The questions are offered at different levels of difficulty involving lower- to higher-order thinking, starting with questions of modest complexity up to those that require more developed reasoning.

In the lessons, students are provided with opportunities to practise solving non-routine questions to help improve their conceptual understanding by applying known content to subject-related problems.

Teacher Reflection

Teacher reflection on the lessons offer important insights to stimulate teachers and their peers to enhance their own practice and the learning of their students. This includes:

- new teaching approaches encouraged by lesson components that can contribute in different ways to student learning and lesson success;
- the use of review lessons that help review learnt material and extend student abilities in problem solving by utilizing known information;
- a focus on student concept and skill acquisition, pedagogical approaches, student errors, time-on-task, deliberate practice and working memory demands.

Enhancement and Consolidation Camps

The Enhancement Camp and the Consolidation Camp offer students the chance to review their subject background knowledge by consolidating previously taught material. The intentions are:

- for students to have opportunities to review past work and to practise applying this knowledge of concepts and ideas through grade-related sets of questions of developing difficulty; and
- for teachers to follow the given format of components with some flexibility to adjust parts of a lesson to meet the learning needs of students in their class, particularly, if students are having difficulties.

Camp Differences

In the case of lessons for students in either the Enhancement Camp or Consolidation Camp, the materials, including the lesson plans and the sets of questions, are, on the surface, the same. These questions range from those of modest difficulty to those which require more insight and more knowledge and understanding.

There are important reasons for both Camps sharing the same content. Exploring and answering these question sets have value to students from both Camps, albeit in different ways. It enables students to work through a range of ideas on their own before hearing from their peers and teacher concerning the same questions – a very rich learning environment. Also, similar questions mean that expectations for students in both Camps is not limited and students have the same potential for growth.

The difference between Camps concerns the teaching focus, which is related to the breadth and depth of conceptual knowledge of students. It is anticipated that based on student performance within a lesson, the teacher will decide whether the class needs more practice and discussion of straightforward questions or whether extension material is more appropriate for the class.

In particular, questions marked as **Optional** (typically high-order questions) are more likely to be addressed in the Enhancement Camp than the Consolidation Camp, but not exclusively. It is the teacher who decides whether to include 'optional' questions and this will depend on student-learning success and understanding at that time.

If Optional questions are not used, teachers would spend that time productively. This includes reinforcing the concepts by increasing the focus on student errors and/or increasing student-student, and student-class directed conversations.

Lower- and Higher-order Skill and Knowledge Development

In all learning, lower-order thinking is a pre-requisite for higher-order skills and knowledge development. Many students are disadvantaged in their attempts to move forward in their learning through a lack of practice and conceptual development of needed lower-order skills, knowledge and understandings. Hence, *all* students benefit from a stock-take on relevant lower-order skills from previously addressed content. This helps establish a basis upon which student learning should build.

In both the Enhancement and Consolidation Camps important lower-order content skills, knowledge and understandings are re-visited at the beginning of each lesson. This helps ensure that potential learning obstacles are made visible to the student and the teacher. It also means that some errors in understanding or misconceptions are identified. This information is important to teachers in helping all students move forward regardless of their achievement levels.

As many questions posed are about applying content already encountered to a new problem, students have the opportunity to use their current knowledge, skill and understanding in a practical way at their level, further developing their conceptualization and understanding of the subject matter.

Both Camps offer students the opportunity to improve their learning and conceptual development by a stepped approach that involves:

(i) reminding students of relevant lower-order skills through practice,
(ii) having students use and discuss their knowledge in sets of graded questions with an emphasis on straightforward questions,
(iii) expecting students to apply their knowledge leading to more breadth in learning,
(iv) beginning an initial focused practice on higher-order skill development.

The approach advocated to solve problems or comprehend passages extends student learning beyond simple repetitive exercises sets. For these students, the teaching part of the lesson requires teachers reviewing closely student solution attempts through student explanation, discussion and questioning of fundamental aspects of topics that are typically found in the earlier questions. Teachers should be sensitive to students' self-perceptions here as they may meet the ideas, presented in the lessons, maybe after many failures with these concepts in the past.

Nevertheless, these students should become aware of the more difficult questions as teachers allow them to consider links or connections between concepts previously taught. There is great value in problem solving for students to have time to read the problem and then be able to indicate in their own words, what the problem is about.

Finally, it is important that students in the Enhancement and Consolidation Camps become aware of what their students know, where it is progressing and how to build on student skills and knowledge. Teachers need to be nurturing and supportive of this development and continually look for evidence of success and growth. Teachers also need to encourage students to persist, continue to practice individual aspects, and use any mistakes/errors they make as an opportunity to learn more. These are important features of a successful learning journey.

Lesson Components: Short Overview

Lesson Component 1 (Lesson Short Review)

Component 1 offers teachers the chance to:

- settle the class quickly;
- review previously encountered information;
- address previous content in the form of a few targeted questions that are *relevant to the current lesson;*
- note what students already know;
- elicit answers from the class to reinforce the important content needed for the lesson; and
- address briefly issues that may arise.

The questions set for the Short Review section of a lesson are designed to *remind* students of knowledge and skills developed when first studying the topic area, which are relevant to the lesson.

Lesson Component 2 (Lesson Purpose/Intention)

This component offers teachers a chance to acquaint students with the purpose/intention of the lesson. It is valuable if students see a link here with their prior knowledge or experience, especially if the teacher can connect it to the responses and levels of student understanding evident in Component 1.

In addition, this component is an appropriate time to address what students might expect/aim to achieve, i.e., their lesson goal(s). Teachers should clarify, in clear language, the learning intention for the students as well as what success will look like. (Note**:** The degree of success or partial success of student learning in the lesson should occur as part of Component 5.)

Lesson Component 3 (Lesson Language Practice)

Component 3 concerns language use – speaking, hearing, listening and comprehending. The focus is on words or phrases that are to be used in the lesson.

The language practice suggested has been identified by considering the whole lesson and identifying those words/phrases that have the potential to cause difficulties for students through speech, or listening, or understanding. Typically, the language identified is restricted to less than 6 words/phrases so that there is enough time to use a variety of approaches of practice within the time available.

Lesson Component 4 (Lesson Activity)

Component 4 has three aspects, 4A, 4B, and 4C.

In the case of the Learning Camp activity, Component 4 addresses the key idea for the lesson. It is about students applying known content to solve real-world problems. This requires students to interpret/understand the correct meaning of the 'stem', a stimulus, (such as a passage/text or diagram or the first part of the problem or story) before answering questions of differing degrees of complexity related to the stem.

Students are first presented with the stem in 4A and are given the time/chance to interpret its meaning. Then in 4B and 4C, two separate sets of questions related to the same stem are asked.

4A Reading and Understanding the Stem

4A involves understanding the language of the stem. The purposes here are for the teacher:

- to model fluent reading of the stem (first)

- to identify any unfamiliar language for the student (possibly addressed in Component 3)
- to read the passage or describe the figure, etc.
- to hear and experience fluency in reading the stem.

4B Solving the First Set of Questions

4B involves a set of questions associated with the stem. Students will need to refer to the stem as they prepare to answer the set of questions. Students write down responses or attempts at each question. It is important that every student in the class is expected to have a response for each question. It is expected and acceptable that students would make errors, which provide teachers with important information concerning students' learning needs. A critical procedural action here for teachers is the importance of **all** students starting on the same set of questions, *at the same time*.

When the students are finished, or sufficient time has been allocated, the teacher marks the questions. This can be achieved by student answers or approaches to the questions and by explaining or justifying their reasons. Time should be allocated to student discussion, explanation, and reasoning about answers.

4C Solving the Second Set of Questions

4C offers a new start for students regardless of how they performed in Component 4B. The structure is very similar to Component 4B, i.e., undertaking a new set of questions related to the same stem. In addition, the lesson structure allows a refresh as 4C presents a new starting point for the student. This structure also allows all students in the class to start a new activity at the same time.

This approach serves two purposes for teachers. *First,* it enables teachers to bring all students back together to proceed as a group with issues able to be directed to and considered by every student at the same time. *Second,* it offers teachers a way to extend their students problem solving practice where *a different sets of questions* can be used with a single Stem. This is an efficient way to incorporate more problem-solving or comprehension practice on specific content into a lesson.

Lesson Component 5 Lesson Conclusion

Component 5 has a high metacognitive aspect for students – students thinking about their own thinking – which can be further enhanced by teacher modelling. Component 5 is designed to offer a student-focused overview to the main intentions of the lesson. In particular, the focus is about helping students reflect on their progress and achievement (or partial achievements) of the lesson intention as well as their understanding development during the lesson.

It builds on comments from Component 2 about teacher expectations. There is the chance here to confirm student progress during the lesson. A teacher may use a diagram, picture or some aspect of the lesson as a catalyst to stimulate student discussion and reflection.

NOTE: A fuller description of the Components and features of the lessons is provided in the **Learning Camp – Notes to Teachers Booklet.** It is recommended that these notes are read and discussed by teachers as they provide a further basis to understanding the structure of lessons and the pedagogy.

Mathematics Grade 7 Lesson Plan 1

Solving Problems using Venn Diagrams

Key Idea

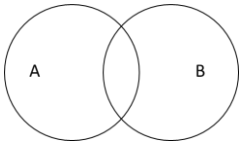
Solve problems using Venn diagrams.

Lesson Component 1 (Lesson Short Review)

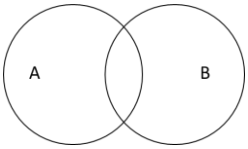
Time: 7 minutes

Questions

1. In the Venn diagram, shade the set:



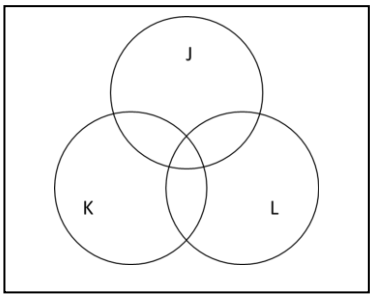
(i) $A \cap B$



(ii) $A \cup B$?

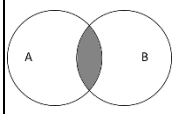
2. If $C = \{0, 1, 2\}$ and $D = \{2, 4, 6\}$, write down the sets $C \cup D$ and $C \cap D$.

3. In the Venn diagram, shade the set $(J \cap K) \cup (K \cap L)$.

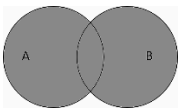


Answers

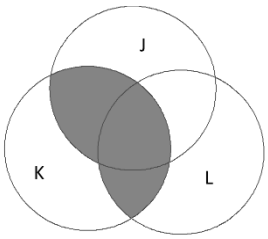
1. (i)



(ii)



3.



2. $C \cup D = \{0, 1, 2, 4, 6\}$; $C \cap D = \{2\}$

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

We can use what we have learned about representing sets in Venn diagrams to help us find solutions to real-world problems. Today, we will employ Venn diagrams in finding solutions to such problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are:

intersection, number of elements, set, subset, union, Venn diagram.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

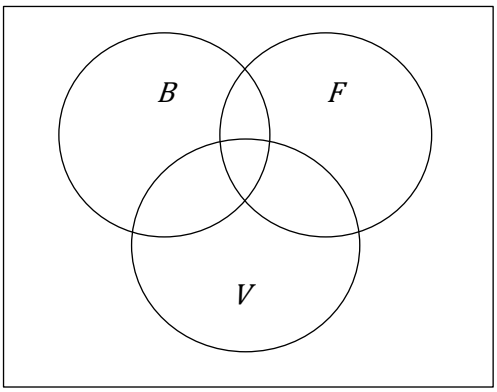
Part 4A

Stem for Items 1 and 2

Angelo's teacher asks her 30 students about their sports after school. They say that they can play one or more of the sports such as basketball, football, and volleyball. Two students say that they play none of the sports.

The teacher also finds out that:

1) 14 play football.
2) Angelo and 2 others play all 3 sports.
3) 15 play volleyball, 4 play football and volleyball only, and 7 play volleyball and basketball only.



The teacher has started the process of representing the information in a Venn diagram, with B representing the set of students who play basketball, F the set of students who play football, and V the set of students who play volleyball.

Part 4B

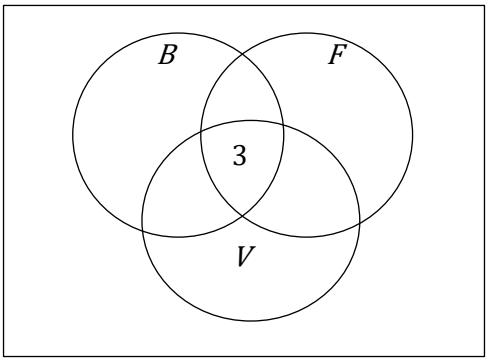
Item 1

Questions

1. (i) Show on the diagram the given information that 3 students play all 3 sports.
   (ii) Using this information and item 3 of Part 4A, find how many students play volleyball only.
2. If 2 students play football only, find how many play basketball and football only.
3. Find how many students play basketball only.

Answers to Item 1

1. (i)



(ii) 1 student

2. 5 students
3. 6 students

Part 4C

Item 2

Questions

1. How many students play one sport only?
2. Angelo decides to no longer play basketball. How many students then do not play exactly one or two of the three sports?
3. (Optional) How many students then play exactly two of the three sports?

Answers to Item 2

1. 9 students
2. 4 students
3. 17 students

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 2

Performing the Four Operations on Integers and Fractions

Key Idea

Find results of performing the four operations on integers and fractions.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

Perform the indicated operations.

1. (i) $-1+3-6=$

   (ii) $-4+[2\times(-3)]=$

2. (i) $2\frac{1}{5}+\frac{3}{10}=$

   (ii) $\frac{7}{8}\times\frac{2}{3}-\frac{1}{4}=$

3. (i) $[(-8+-4)\div(-6)]-7=$

   (ii) Ahmed's teacher asks him to: "start with $+2$, then multiply by -1, then subtract 3, then divide by -1, then add -6". What should Ahmed's answer be?

Answers

1. (i) -4

   (ii) -10

2. (i) $2\frac{1}{2}$

   (ii) $\frac{1}{3}$

3. (i) -5

   (ii) -1

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

We can use what we have learned about whole numbers, or integers, and fractions to find results of performing on these numbers one or more of addition, subtraction, multiplication, and division. Today, we will obtain such results and use them in the solution of some real-life problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are:

add/subtract/multiply/divide, fraction, integer, numerical, operation, value.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

Stem for Items 1 and 2

Maria and Juan are playing a Numerical game, using Board 1 and Board 2. The players move their markers according to the number operations on the cards that they draw from the card pile. The first player to reach the HOME SQUARE is the winner.

Board 1

11	12	13	14	15	16	17	18	19	20
1	2	**3**	4	5	6	7	8	9	10
–9	–8	–7	–6	–5	–4	–3	–2	–1	0
–19	–18	–17	–16	–15	–14	–13	–12	–11	–10

Maria

11	12	13	14	15	16	17	18	19	20
1	2	**3**	4	**5**	6	7	8	9	10
–9	–8	–7	–6	–5	–4	–3	–2	–1	0
–19	–18	–17	–16	–15	–14	–13	–12	–11	–10

Juan

Board 2

	$1\frac{11}{20}$	$1\frac{3}{5}$	$1\frac{13}{20}$	$1\frac{7}{20}$	$\mathbf{1\frac{3}{4}}$	$1\frac{4}{5}$	$1\frac{17}{20}$	$1\frac{9}{10}$	$1\frac{19}{20}$	2
	$1\frac{1}{20}$	$1\frac{1}{10}$	$1\frac{3}{20}$	$1\frac{1}{5}$	$1\frac{1}{4}$	$1\frac{3}{10}$	$1\frac{7}{20}$	$1\frac{2}{5}$	$1\frac{9}{20}$	$1\frac{1}{2}$
	$\frac{11}{20}$	$\frac{3}{5}$	$\frac{13}{20}$	$\frac{7}{20}$	$\frac{3}{4}$	$\frac{4}{5}$	$\frac{17}{20}$	$\frac{9}{10}$	$\frac{19}{20}$	1
0	$\frac{1}{20}$	$\frac{1}{10}$	$\frac{3}{20}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{3}{10}$	$\frac{7}{20}$	$\frac{2}{5}$	$\frac{9}{20}$	$\frac{1}{2}$

Maria

	$1\frac{11}{20}$	$1\frac{3}{5}$	$1\frac{13}{20}$	$1\frac{7}{20}$	$1\frac{3}{4}$	$\mathbf{1\frac{4}{5}}$	$1\frac{17}{20}$	$1\frac{9}{10}$	$1\frac{19}{20}$	2
	$1\frac{1}{20}$	$1\frac{1}{10}$	$1\frac{3}{20}$	$1\frac{1}{5}$	$1\frac{1}{4}$	$1\frac{3}{10}$	$1\frac{7}{20}$	$1\frac{2}{5}$	$1\frac{9}{20}$	$1\frac{1}{2}$
	$\frac{11}{20}$	$\frac{3}{5}$	$\frac{13}{20}$	$\frac{7}{20}$	$\frac{3}{4}$	$\frac{4}{5}$	$\frac{17}{20}$	$\frac{9}{10}$	$\frac{19}{20}$	1
0	$\frac{1}{20}$	$\frac{1}{10}$	$\frac{3}{20}$	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{3}{10}$	$\frac{7}{20}$	$\frac{2}{5}$	$\frac{9}{20}$	$\frac{1}{2}$

Juan

Maria and Juan use their Board 1 and 'Operations on Integers' cards for Game 1, with 'Home' squares $(+)3$ (Maria) and $(+)5$ (Juan).

They use their Board 2 and 'Operations on Fractions' cards for Game 2, with 'Home' squares $1\frac{3}{4}$ (Maria) and $1\frac{4}{5}$ (Juan).

Part 4B

Item 1 (Game 1)

Questions

1. Maria is on her '$(+)2$ square'. She draws a card that says 'subtract 9'. To which square should she move?
2. Juan is on his '-1 square'. He draws a card that says 'add -2 and then multiply by -5'. To which square should he move?
3. (Optional) Maria is later on her '-18 square' and Juan on his '-1 square'. For their next moves, Maria's card says 'divide by -2, then add -4, then multiply by -3, and then subtract -9', while Juan's card says 'multiply by -4, then subtract -8, then divide by -3, and then add -1'.

   Which player will:

   (i) end their move on the square with the larger value?

   (ii) be closer (numerically) to their 'Home square'?

Answers to Item 1

1. '–7 square'
2. '+15 square'
3. (i) Juan

   (ii) Maria

Part 4C

Item 2 (Game 2)

Questions

1. Maria is on her '$1\frac{1}{10}$ square'. She draws a card that says 'add $\frac{9}{10}$'. To which square should she move?
2. Juan is on his '$\frac{3}{4}$ square'. He draws a card that says 'multiply by $\frac{4}{5}$. and then subtract $\frac{1}{2}$'. To which square should he move?
3. (Optional) Maria is later on her '$1\frac{7}{20}$ square' and Juan on his '$1\frac{1}{5}$ square'. For their next moves, Maria's card says 'divide by $\frac{3}{4}$, then subtract $\frac{1}{4}$', while Juan's card says 'multiply by $1\frac{1}{2}$, then subtract $\frac{1}{5}$'. Which player will be closer (numerically) to their 'Home square'?

Answers to Item 2

1. '2 square'
2. '$\frac{1}{10}$ square'

Maria and Juan are equally close.

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 3

Solving Problems involving Real Numbers

Key Idea

Solve problems involving real numbers.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

1. (i) $\frac{2}{3} \times \frac{5}{8} =$

   (ii) $\frac{5}{6} - \frac{3}{5} =$

2. Express $\frac{7}{8}$ as a percentage.

3. Sam's age is x. His sister Jo is 2 years more than 1.1 times his age.

   (i) What is Jo's age in terms of x?

   (ii) Write an equation to find x, if the sum of Sam's and Jo's ages is 44.

Answers

1. (i) $\frac{5}{12}$

   (ii) $\frac{7}{30}$

2. $87\frac{1}{2}\%$

3. (i) $1.1x + 2$

   (ii) $x + 1.1x + 2 = 44$ (or $2.1x = 42$)

Lesson Component 2 (Lesson Purpose/Intention)
Time: 3 minutes
Teacher states:

We can use what we have learned about integers, fractions, decimals, and percentages to help us solve real-life problems. Today, we will use these different types of real numbers to find the solutions to such problems.

Lesson Component 3 (Lesson Language Practice)
Time: 5 minutes
Key words/terms are:

company, co-owner, percentage, sale/sell/sold, share.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

Stem for Items 1 and 2

In 2022, James and Paul started a small company as co-owners.

In 2023, James sold $\frac{2}{5}$ of his $\frac{7}{8}$ share to Paul.

In 2024, James and Paul are selling a 50% share to Bella and will each retain a 25% share.

Bella has not revealed her age to James and Paul, but loves Mathematics problems and tells them that:

1) "The sum of our ages is 138."

2) "James is 1 year more than 1.55 times my age and Paul is 3 years less than 0.95 times my age."

Part 4B

Item 1

Questions

1. Show that James sold $\frac{7}{20}$ of the company to Paul in 2023.
2. Show that James held a $\frac{21}{40}$ share after the sale to Paul.
3. (Optional) For the 2024 break-up of shares, what percentage of the company will:

   (i) James need to sell? (ii) Paul need to sell?

Answers to Item 1

1. James sold $\frac{2}{5}$ of his $\frac{7}{8}$ share to Paul$= \frac{2}{5} \times \frac{7}{8}$

$$= \frac{7}{20}$$

2. James' share after sale to Paul$= \frac{7}{8} - \frac{7}{20}$ (using $\frac{7}{20}$ result found in Question 1.)

$$= \frac{35}{40} - \frac{14}{40}$$

$$= \frac{21}{40}$$

3. (i) James: $27\frac{1}{2}\%$ (ii) Paul: $22\frac{1}{2}\%$

Part 4C

Item 2

Questions

1. Write the names of the three 2024 owners from youngest to oldest, using the information in Item 2 of Part 4A.
2. If Bella's age is taken to be x, write down James' and Paul's ages in terms of x.
3. (Optional) How old are James, Paul, and Bella?

Answers to Item 2

1. Paul, Bella, James
2. James: $1.55x + 1$; Paul: $0.95x - 3$
3. Bella: 40; James: 63; Paul: 35

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)
Time: 5 minutes
The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 4

Solving Problems involving Conversion of Units of Measurement

Key Idea

Solve problems involving conversion of units of measurement.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

1. Convert $80\,000$ meters to kilometers.
2. If $1\ \text{km}^2 = 100$ hectares, how many hectares are there in $12.5\ \text{km}^2$?
3. (i) Show that the volume (in m^3) of a container in the shape of a cube of side $300\ \text{cm}$ is $27\ \text{m}^3$.

   (ii) If the container holds material weighing $100\ \text{kg}$ per cubic meter, how many tonnes of the material does the container hold? $(1\ \text{tonne} = 1000\ \text{kg})$

Answers

1. 80 kilometers
2. 1250 hectares
3. (i) $\text{Volume of container} = 3\ \text{m} \times 3\ \text{m} \times 3\ \text{m}$ (since $300\ \text{cm} = 3\ \text{m}$)

   $= 27\ \text{m}^3$

   (ii) 2.7 tonnes

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

We can use what we have learned about units of measurement to help us solve real-life problems. Today we will use different units of measurement and conversion of units to solve such problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are:

conversion, cubic meter, hectare, rectangular, rectangular prism, tonne, unit, volume.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

Stem for Items 1 and 2

Farmer Jack is inspecting a rectangular paddock of length 3500 meters and breadth 2500 meters. He has already inspected the square section of side 1.5 km within the paddock that was occupied recently by a wheat crop.

Jack is now driving along the paddock's outside fencing to check its condition. In good weather, he can inspect 400 meters of fencing per hour in an 8-hour workday.

Part 4B

Item 1

Questions

1. In good weather, how many workdays will it take Jack to inspect all the outside fencing?
2. How many kilometers will Jack drive along the outside fencing?
3. (Optional) Jack needs to calculate the amount of space available in the paddock for other crops.

   If $1\ \text{km}^2 = 100$ hectares, how many hectares are available?

Answers to Item 1

1. 3.75 workdays
2. 12 km
3. 650 hectares

Part 4C

Item 2

Questions

1. The recent wheat crop yielded $560\ 000$ kg of wheat.

   How many tonnes of wheat did the crop yield?
2. If a wheat train hopper car is in the shape of a rectangular prism 10 meters long, 3 meters wide, and 5 meters high, what volume in cubic meters can a hopper car hold?
3. (Optional) If wheat weighs 800 kg per cubic meter, how many hopper cars were needed to transport Jack's wheat?

Answers to Item 2

1. 560 tonnes
2. $150\ \text{m}^3$
3. 5 hopper cars (4 cars full and 1 car two—thirds full)

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material in this lesson high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 5

Using Models and Algebraic Methods to find Algebraic Products

Key Idea

Use models and algebraic methods to find algebraic products.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

1. Expand
   (i) $x\,(2x)$
   (ii) $2x\,(3y)$
2. Simplify
   (i) $6x + 5x$
   (ii) $2ab - 9ab$
3. Expand
   (i) $2x(x + 2)$
   (ii) $(3x)^2$
   (iii) $2y(y^2 + 3y$+1)

Answers

1. (i) $2x^2$
   (ii) $6xy$
2. (i) $11x$
   (ii) $-7ab$
3. (i) $2x^2 + 4x$
   (ii) $9x^2$
   (iii) $2y^3 + 6y^2 + 2y$

Lesson Component 2 (Lesson Purpose/Intention)

Time: 5 minutes

Teacher states:

We can use what we have learned in our study of algebra about algebraic expressions, models, and algebraic methods to help us find algebraic products. Today, we will use some models and algebraic methods to find various algebraic products.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are:

algebraic expression, algebraic product, investigate, model, square, trinomial.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

Stem for Items 1 and 2

Ellen is investigating algebraic products. She is drawing diagrams made up of rectangles to help her find the algebraic products obtained when she multiplies $2x + 3$ by another algebraic expression $3x + 5$, and $2x + 3$ by itself, i.e., the square of $2x + 3$ (or $(2x + 3)^2$).

Diagram 1

	$2x$	3
$3x$	Area 1	Area 3
5	Area 2	Area 4

Diagram 2

	$2x$	3
$2x$	Area 1	Area 3
3	Area 2	Area 4

Part 4B

Item 1

Questions

1. Expand $2x(5x)$
2. (i) For Diagram 1, write down an algebraic expression for each of Area 1, Area 2, Area 3 and Area 4.

   (ii) What is the simplest way to write the algebraic product $(2x + 3)(3x + 5)$?
3. From what she has discovered, what should Ellen write as the algebraic product of $(5x + 3y)$ and $(2x - y)$?

Answers to Item 1

1. $10x^2$
2. (i) Area 1$= 6x^2$; Area 2$= 10x$; Area 3$= 9x$; Area 4$= 15$

   (ii) $6x^2 + 19x + 15$
3. $10x^2 + xy - 3y^2$

Part 4C

Item 2

Questions

1. Expand $4x(2x-1)$
2. (i) For Diagram 2, write down an algebraic expression for each of Area 1, Area 2, Area 3 and Area 4.

   (ii) What is the simplest way to write the algebraic product $(2x+3)^2$?
3. From what she has discovered, what should Ellen write as the algebraic products of:

   (i) $(7x-5y)^2$?

   (ii) (Optional) $(2x-y)(4x^2+2xy+y^2)$?

Answers to Item 2

1. $8x^2-4x$
2. (i) Area 1= $4x^2$; Area 2= $6x$, Area 3= $6x$; Area 4= 9

   (ii) $4x^2+12x+9$
3. (i) $49x^2-70xy+25y^2$

   (ii) $8x^3-y^3$

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 6 Deliberate Practice

Solving Problems using Venn Diagrams
Solving Problems involving Real Numbers
Solving Problems involving Conversion of Units of Measurement

Key Ideas

Solve problems using Venn diagrams.

Solve problems involving real numbers.

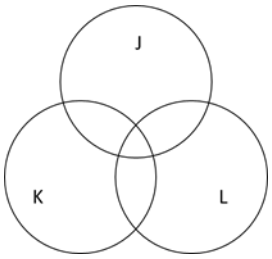
Solve problems involving conversion of units of measurement.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

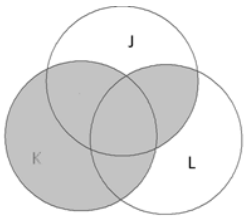
1. In the Venn diagram,
   shade the set $(J \cup K) \cap (K \cup L)$.



2. Express $\frac{5}{6}$ as a percentage.
3. (i) Convert $65\ 200$ millimeters to meters.
   (ii) A tank in the shape of a rectangular prism has length 2 meters, width 1.5 meters and height 70 centimeters. What is the volume of the tank in liters? $(1 \text{ cubic meter} = 1000 \text{ liters})$

Answers

1.



2. $83\frac{1}{3}\%$
3. (i) 65.2 meters.
   (ii) 2100 liters

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

We have been working on the solution of problems using Venn diagrams and problems involving real numbers and the conversion of units of measurement. Today, we are going to consolidate this work through the solution of such problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms that we have met in the previous five lessons that are most relevant to this lesson are:

conversion, cubic meter, fraction, intersection, percentage, rectangular prism, set, tonne, union, Venn diagram, volume.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

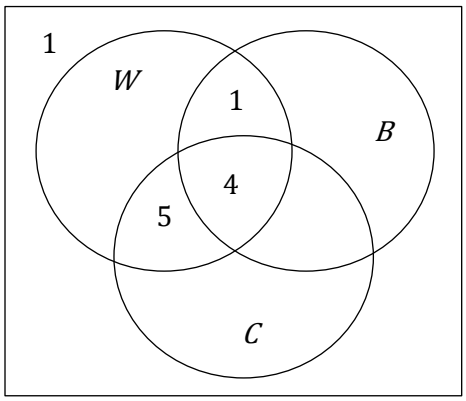
Stem for Items 1 and 2

In Erica's regional area there are 29 grain farms. There are 28 farms that grow at least one of the grains: wheat (W), barley (B), and corn (C), while there are 4 farms that grow all three of the grains.

Erica also knows that:

- 12 farms grow wheat and 18 grow corn.
- 1 farm grows barley and wheat only, and 5 grow wheat and corn only.

She has begun representing the information in a Venn diagram.



A truck for carrying barley from farms in the area includes a semi-trailer and a dog trailer with their carry sections in the shape of rectangular prisms. The dimensions of the carry sections of the two trailers are:

semi-trailer: 12.3 meters long, 2.4 meters wide and 2.5 meters high.

dog trailer: 9.5 meters long, 2.4 meters wide and 2.5 meters high.

Part 4B

Item 1 (using the information for and from the Venn diagram)

Questions

1. Find how many farms grow wheat only.
2. If three farms grow corn only, find how many farms grow corn and barley only.
3. Find how many farms grow barley only.

Answers to Item 1

1. 2 farms
2. 6 farms
3. 7 farms

Part 4C

Item 2 (using the information about the truck for carrying barley)

Questions

1. Show that the total floor area of the two trailers is 52.32 square meters.
2. What is the total volume of the two trailers?
3. If barley weighs 600 kg per cubic meter, how many tonnes of barley can the truck carry at one time?

Answers to Item 2

1. Total floor area $= (12.3 \times 2.4) + (9.5 \times 2.4)$

   $= 21.8 \times 2.4$

   $= 52.32 \text{ m}^2$

2. 130.8 m^3
3. 78.48 tonnes

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
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Mathematics Grade 7 Lesson Plan 7

Solving Problems involving Algebraic Expressions

Key Idea

Solve problems involving algebraic expressions.

Lesson Component 1 (Lesson Short Review)
Time: 7 minutes

Questions

1. Write down the number that is:

   (i) 7 more than x

   (ii) 5 less than 9 times x

2. Jennifer is k years old. Clare is 5 years older than Jennifer and Helen is 7 years younger.

   What is the total of their ages?

3. Mac's Building Supplies charges 30 000 Philippine pesos per pallet of house bricks (b), plus a single delivery fee of 4500 Philippine pesos.

   Write an algebraic expression to represent this information and use it to calculate the cost of buying 4 pallets of bricks from Mac's.

Answers

1. (i) $x + 7$

   (ii) $9x - 5$

2. $3k - 2$

3. $30\,000b + 4500$

   Cost of 4 pallets $= 124\,500$ Philippine pesos

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

We can use what we have learned in our study of algebra about algebraic expressions and algebraic methods to help us solve real-life problems. Today, we will use algebraic expressions and methods to find the solutions to such problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are:

charge, hire, hiring period, insurance, standard fee.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

Stem for Items 1 and 2

Amanda and Michael and their friends, Jan and Brian, are traveling in Lake Sebu.

Amanda and Michael hire a car and a van from Joe's Hire.

Car rental costs 100 pesos for each day (d), plus a standard fee of 35 pesos for the hiring period.

Van rental costs 140 pesos for each day (d), plus a standard fee of 55 pesos for the hiring period.

Jan and Brian hire a car and a van from Bob's Hire.

Car rental costs 90 pesos for each day (d), plus a standard fee of 75 pesos for the hiring period.

Van rental charges are exactly twice those of hiring a car.

Part 4B

Item 1

Questions

1. Write down an algebraic expression in terms of d for the cost of hiring a car from Joe's.
2. Write down an algebraic expression in terms of d for the cost of hiring a van from Joe's.
3. Calculate the total amount that Amanda and Michael will be charged if Amanda hires a car for 3 days, Michael hires a van for 5 days, and they each take extra insurance charged at 30 pesos per day for cars and 50 pesos per day for vans.

Answers to Item 1

1. $100d + 35$
2. $140d + 55$
3. 1430

Part 4C

Item 2

Questions

1. Write down an algebraic expression in terms of d for the cost of hiring a car from Bob's.
2. Write down an algebraic expression in terms of d for the cost of hiring a van from Bob's.
3. (i) What is the total amount Jan and Brian will be charged if Jan hires a car for 3 days, Brian hires a van for 5 days, and they do not take extra insurance?

   (ii) How much more will Amanda and Michael pay than Jan and Brian?

Answers to Item 2

1. $90d + 75$
2. $180d + 150$
3. (i) ₱ 1395

   (ii) ₱ 35

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
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Mathematics Grade 7 Lesson Plan 8

Solving Problems involving Linear Equations and Inequalities in One Variable

Key Idea

Solve problems involving linear equations and inequalities in one variable.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

1. How old in years is a person:
   (i) 5 years younger than a person of age y years?
   (ii) 3 years more than twice as old as a person of age m years?
2. The smallest of 3 consecutive even numbers is x.
   Write down the other two numbers in terms of x.
3. Brian is 5 years less than twice his brother Steve's age. The sum of their ages is between 28 and 40.
   If Steve's age is x, what inequality would represent this information?

Answers

1. (i) $y - 5$
   (ii) $2m + 3$
2. $x + 2, x + 4$
3. $28 < 3x - 5 < 40$

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

We can use what we have learned in our study of algebra about equations and inequalities to help us solve real-life problems. Today, we will use equations and inequalities in finding the solutions to such problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are: consecutive, inequality, less than/greater than, linear equation, linear inequality, solve.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

Stem for Items 1 and 2

Jane loves solving Mathematics problems and is attending a family reunion. She meets her Aunt Liz and her three sons for the first time.

Jane discovers that her three cousins also love Mathematics problems.

The boys say that:

- their ages are consecutive odd numbers that total 45 years.
- their sister Amber is 31 years younger than Aunt Liz and that in 7 years' time Aunt Liz will be one year more than 3 times older than Amber.

Jane says that:

- her father is 9 years older than her mother and that their ages total 85 years.
- her older sister Marilyn is 3 years less than twice Jane's age and that the sum of their ages is greater than 33 but less than 42.

Part 4B

Item 1

Questions

1. Write down the three boys' ages if x is taken to be the youngest boy's age.
2. Set up and solve an equation to find the ages of the three boys.
3. (Optional) If y is taken to be Amber's age, set up and solve another equation to find her age and Aunt Liz's age.

Answers to Item 1

1. The three boys are x years, $(x + 2)$ years, and $(x + 4)$ years.
2. Equation: $3x + 6 = 45$

   The three boys are 13, 15, and 17 years old.
3. Equation: $y + 7 = 3(y + 7) + 1$; Amber is 8 years old, and Aunt Liz is 39 years old.

Part 4C

Item 2

Questions

1. (i) Write down the ages of Jane's parents if y is taken to be her father's age.

   (ii) Set up and solve an equation to find the ages of Jane's parents.
2. Write down Jane's and Marilyn's ages if z is taken to be Jane's age.
3. (Optional) Set up and solve an inequality to find the greatest age that Jane could be.

Answers to Item 2

1. (i) y and $y - 9$

   (ii) Equation: $y + (y - 9) = 85$

   Jane's father is 47 years old and her mother is 38 years old.
2. z and $2z - 3$
3. Inequation: $33 < z + (2z - 3) < 42$ (Solution: $12 < z < 15$)

   The greatest age that Jane could be is 14.

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 9

Identifying and Applying Relationships of Angles at a Point and on a Straight Line

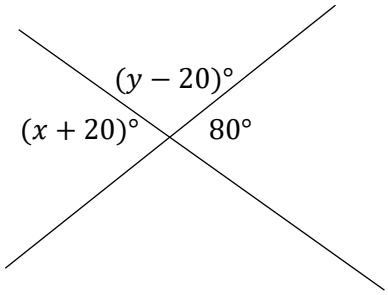
Key Idea

Identify and apply relationships of angles at a point and on a straight line.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

1. (i) Complete: An acute angle measures less than …… degrees.
   (ii) Complete: An obtuse angle measures between …… degrees and …… degrees.
2. (i) The measures of angles at a point add to ……degrees.
   (ii) The measures of vertically opposite angles are ……..
3. 

   Find x and y.

Answers

1. (i) 90
   (ii) 90, 180
2. (i) 360
   (ii) equal
3. $x = 60;\ y = 120$

Lesson Component 2 (Lesson Purpose/Intention)

Time: 5 minutes

Teacher states:

We can use what we have learned in our study of geometry to help us solve real-life problems. Today, we will use our knowledge of angles at a point and on a straight line in finding the solutions to such problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are:

adjacent, angles at a point, intersecting, measure, right angle, straight angle, vertically opposite.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

Stem for Items 1 and 2

Max is a designer and is creating designs for the entry to a new building. He needs to know the sizes of all the angles that he uses in his designs and to know their relationships with other angles in the designs.

The diagrams below show parts of Max's designs.

Diagram 1: *shows two adjacent angles, $\angle ABD$ and $\angle DBC$, which measures together make a right angle.*

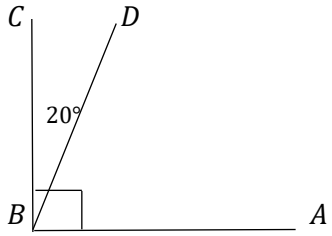


Diagram 2: shows three angles meeting at a point.

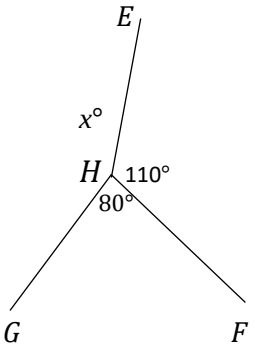


Diagram 3: *shows two intersecting straight lines JK and LM.*

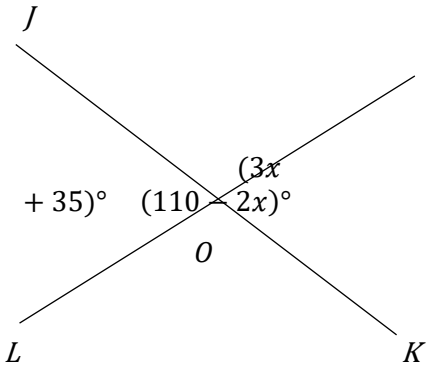


Diagram 4: shows two adjacent angles, $\angle PQS$ and $\angle SQR$, whose measures together make a straight angle.

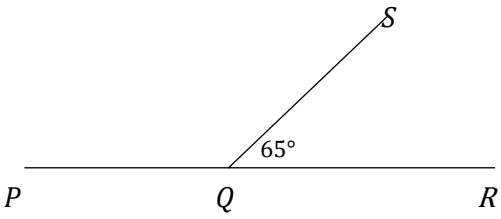


Diagram 5: shows angles meeting at the point Z. XY is a straight line.

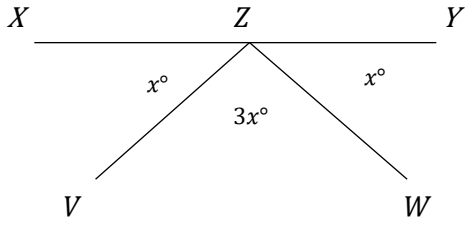
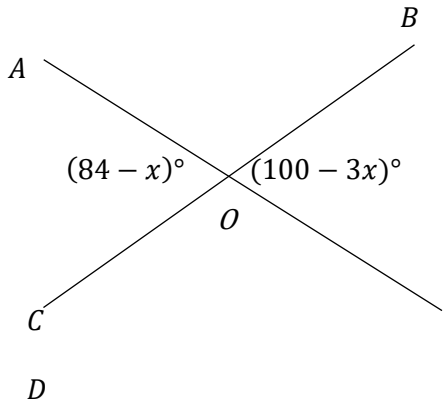


Diagram 6: shows two intersecting straight lines AD and BC.



Part 4B

Item 1

Questions

1. (i) What types of angles are a pair of angles that together make a right angle?

   (ii) In Diagram 1, $\angle DBC = 20°$. Find the size of $\angle ABD$.

2. In Diagram 2,

   (i) find the value of x.

   (ii) What type of angle is $\angle EHG$?

3. (Optional) In Diagram 3, find the value of x and the size of $\angle KOM$ and $\angle JOM$.

Answers to Item 1

1. (i) complementary angles

   (ii) $70°$

2. (i) $170°$

   (ii) reflex angle

3. $x = 15;\ \angle KOM = 80°; \angle JOM = 100°$

Part 4C

Item 2

Questions

1. (i) What types of angles are a pair of angles that together make a straight angle?

   (ii) In Diagram 4, $\angle SQR = 65°$. Find the size of $\angle PQS$.

2. In Diagram 5,

   (i) find the value of x.

   (ii) What type of angle is $\angle VZW$?

3. (Optional) In Diagram 6, find the size of each of the four angles.

Answers to Item 2

1. (i) supplementary angles

   (ii) $115°$

2. (i) 36

   (ii) obtuse angle

3. $\angle AOC = 76°; \angle BOD = 76°, \angle AOB = 104°, \angle COD = 104°$

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)
Time: 5 minutes
The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 10

Identifying and Applying Relationships among Angles formed by Parallel Lines cut by a Transversal

Key Idea

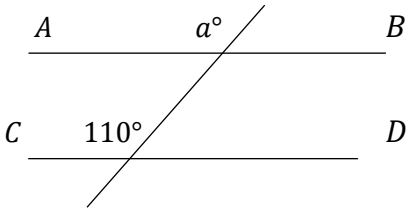
Identify and apply relationships among angles formed by parallel lines cut by a transversal.

Lesson Component 1 (Lesson Short Review)

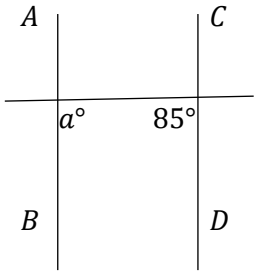
Time: 7 minutes

Questions

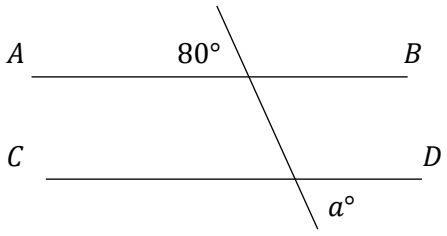
1. Complete: When a transversal meets two or more parallel lines:
   (i) the alternate angles formed are …….
   (ii) the co-interior angles formed are …….
   (iii) the corresponding angles formed are …….
2. In the following diagrams, $AB||CD$. In each case, find the value of a, giving a reason or reasons.
   (i)



   (ii)



   (iii)



Answers

1. (i) equal
   (ii) supplementary
   (iii) equal
2. (i) $a = 110$ (corresponding angles, $AB||CD$)
   (ii) $a = 95$ (co-interior angles, $AB||CD$)
   (iii) $a = 80$ ((exterior) alternate angles, $AB||CD$)

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

We can use what we have learned in our study of geometry to help us solve real-life problems. Today, we will use our knowledge of angles formed by parallel lines cut by a transversal in finding the solutions to such problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are:

alternate, co-interior, corresponding, horizontal, oblique, parallel, transversal.

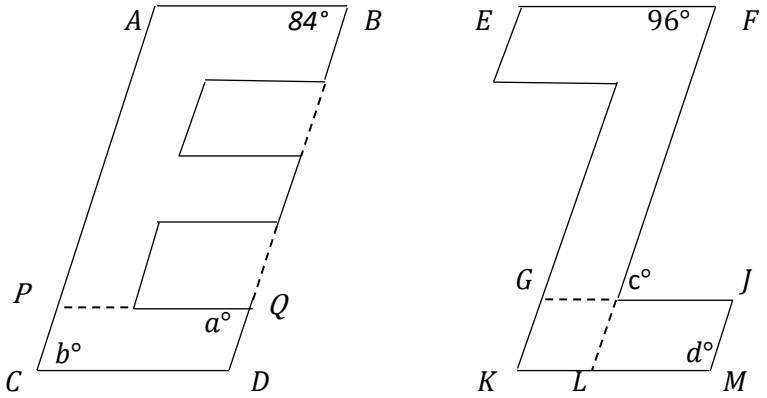
Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

<u>Stem for Items 1 and 2</u>

<u>Diagram 1</u>



** Please note that $a°$ corresponds to $\angle PQD$, $b°$ corresponds to $\angle ACD$,* and *$d°$ corresponds to $\angle JML$.*

Jemima is designing a tiled logo for a leisure company called 'E-Zee' using only straight lines.

All the lines in the logo:

1. that run from left to right ('horizontal' lines) are parallel.
2. that are oblique ('sloping' lines) are parallel.

To align the parts of the logo accurately, Jemima must be sure that all the angles in the design are correct. Some of the tiling in the logo will include tiles meeting as in the diagrams below.

<u>Diagram 2</u>

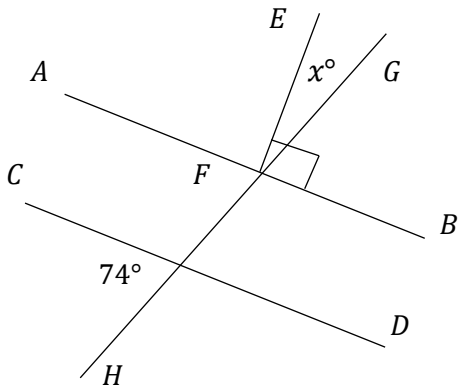
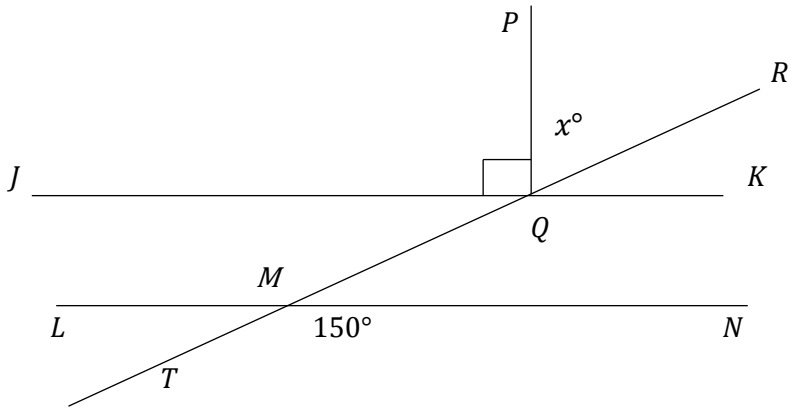


Diagram 3



Part 4B

Item 1

Questions

1. In Diagram 1, find the value of a and give a reason for your answer.
2. In Diagram 1, find the value of b, giving reasons for your answer.
3. In Diagram 2, find the value of x, giving reasons for your answer.

Answers to Item 1

1. $a = 84$; $\angle PQD = \angle ABD$ (corresponding angles, $AB||PQ$)
   $= 84°$
   $a° = 84°$
2. $b = 84$; $\angle BAC = 96°$ (co-interior angles, $AC||BD$)
   $\angle ACD = 84°$ (co-interior angles, $AB||CD$)
3. $x = 16$; $\angle BFG = 74°$ ((exterior) alternate angles, $AB||CD$)
   $\angle EFG = 90° - \angle BFG$ (given $\angle EFB$ is a right angle)
   $= 90° - 74°$
   $= 16°$

Part 4C

Item 2

Questions

1. In Diagram 1, find the value of c and give a reason for your answer.
2. In Diagram 1, find the value of d, giving reasons for your answer.
3. In Diagram 3, find the value of x, giving reasons for your answer.

Answers to Item 2

1. $c = 96$; alternate angles, $EF||GJ$
2. $d = 84$; $\angle FLK = 180° - 96°$ (co-interior angles, $EF||KM$)
   $= 84°$
   $\angle JML = 84°$ (corresponding angles, $FL||JM$)
3. $x = 60$; $\angle JQR = \angle TMN$ ((exterior) alternate angles, $JK||LN$)
   $= 150°$
   $\angle PQR = \angle JQR - 90°$ (given $\angle JQP$ is a right angle)
   $= 150° - 90°$
   $= 60°$

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 11

Identifying and Applying Relationships among the Parts of a Circle

Key Idea

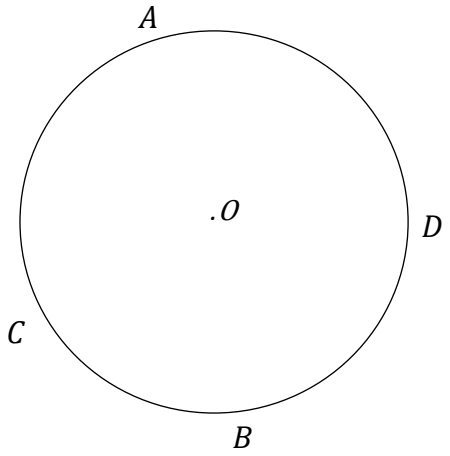
Identify and apply relationships among the parts of a circle.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

1.



Complete:

(i) Each of the circle parts AC, BC, BD and AD that make up the circumference of the circle is called a/an ……

(ii) A/An …… of a circle is a line segment that joins the center of the circle to a point on the circumference.

2. Complete:

(i) A line segment joining any two points on the circumference of a circle is called a/an ……

(ii) A line segment joining any two points on the circumference of a circle and passing through the center of the circle is called a/an ……

3. A/An …… is an angle whose vertex lies on the circumference of a circle and whose arms are two chords of the circle.

Answers

1. (i) arc
   (ii) radius
2. (i) chord
   (ii) diameter
3. inscribed

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

We can use what we have learned in our study of geometry to help us solve real-life problems. Today, we will use our knowledge of relationships among the parts of a circle in finding the solutions to such problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are:

central angle, chord, circumference, diameter, inscribed angle, radius, semi-circle.

Lesson Component 4 (Lesson Activity)

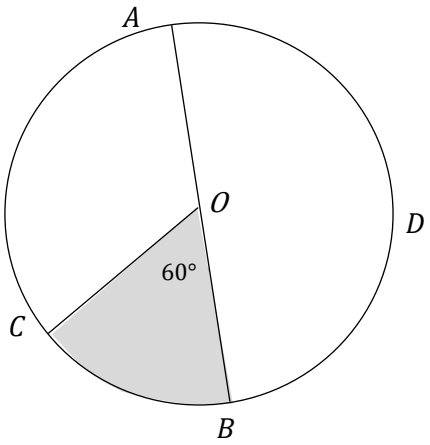
Time: 25 minutes

Part 4A

Stem for Items 1 and 2

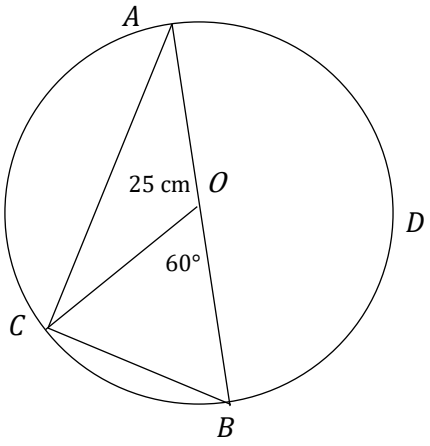
Carl is constructing designs using circles and related parts of circles. To create his designs, he needs to identify the various parts of circles used and relationships between them.

Diagram 1 (Design 1 part (a))



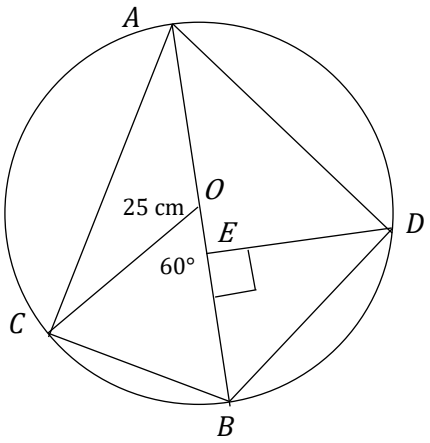
In Design 1 part (a), Carl has divided a circle into three parts. O is the center of the circle. $A, B, C,$ and D are points on the circumference of the circle. AB and OC are straight lines.

Diagram 2 (Design 1 part (b))



In Design 1 part (b), Carl has drawn straight lines from B to C and from A to C, to form the triangles BOC and AOC. He knows that OC is 25 cm long and he measures the line AC to be 43.3 cm long.

Diagram 3 (Design 1 part (c))



In Design 1 part (c), Carl has added chords AD and BD. He measures the inscribed angle, $\angle ADB$, and notes that it measures $90°$. He also observes that this is the case regardless of where he places D on the arc ADB.

Part 4B

Item 1

Questions

1. (i) How many times longer than OC is AB?
   (ii) What terms should Carl use to describe the parts of the circle AB and OC?
2. (i) What shape is formed by arc ADB and line AB?
   (ii) What fraction of the area of this shape is the shaded area OBC?
3. (Optional) If using string to form the two smaller triangles in Design 1 part (b) (without forming OC twice), how much string will Carl need?

Answers to Item 1

1. (i) two times longer
   (ii) AB is a diameter; OC is a radius
2. (i) semi-circle
   (ii) $\frac{1}{3}$
3. 143.3 cm

Part 4C

Item 2

Questions

1. Complete the conclusion that Carl can draw from what he observed in Design 1 part (c): 'For a semi-circle, the measure of the central angle, $\angle AOB$, is ……. the measure of the inscribed angle, $\angle ADB$.
2. Carl has discovered that the three chords, AD, BD and AB form the right triangle ADB.

   Without measuring any of the three sides, which side of the triangle must be the longest side? Why?
3. Carl needs to find the area of triangle ADB for his design. He measures the height DE of the triangle accurately and finds its length to be 24 cm. Find the area of triangle ADB.

Answers to Item 2

1. twice
2. AB, because it is opposite the largest angle ($\angle ADB = 90°$).
3. Area triangle $ADB = 600 \text{ cm}^2$

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 12 Deliberate Practice

Solving Problems involving Algebraic Expressions
Solving Problems involving Linear Equations and Inequalities in One Variable
Identifying and Applying Relationships of Angles at a Point and on a Straight Line
Identifying and Applying Relationships among Angles formed by Parallel Lines cut by a Transversal
Identifying and Applying Relationships among the Parts of a Circle

Key Ideas

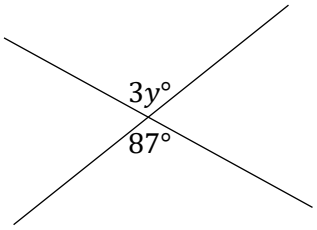
Solve problems involving algebraic expressions.
Solve problems involving linear equations and inequalities in one variable.
Identify and apply relationships of angles at a point and on a straight line.
Identify and apply relationships among angles formed by parallel lines cut by a transversal.
Identify and apply relationships among the parts of a circle.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

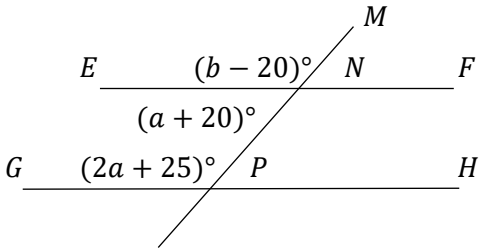
Questions

1.



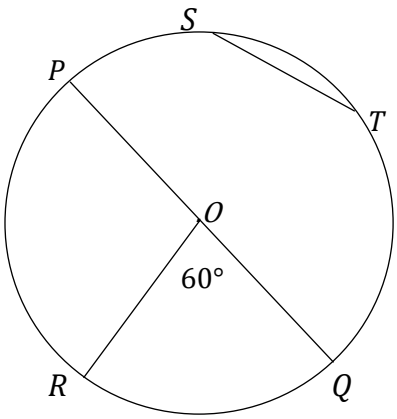
Find the value of y and justify your answer.

2. In the diagram, $EF||GH$.



Find the values of a and b, justify your answers.

3.



In the diagram, $\overline{OR} = (3x + 15)$ m and $\overline{ST} = \frac{1}{3}\overline{PQ}$.

Write down the measures of $\overline{PQ}$ and $\overline{ST}$ in terms of x.

Answers

1. $3y = 87$ (vertically opposite angles)

$$y = 29$$

2. $\angle ENP + \angle GPN = 180°$ (co-interior angles, $EF||GH$)

$$(a + 20)° + (2a + 25)° = 180°$$
$$3a = 135$$
$$a = 45$$
$$\angle ENP + \angle ENM = 180°\ (\angle MNP \text{ is a straight angle})$$
$$(a + 20)° + (b - 20)° = 180°$$
$$a + b = 180$$
$$45 + b = 180$$
$$b = 135$$

3. $PQ = 2OR$ (PQ is a diameter and OR is a radius)

$$= 2(3x + 15)\ \text{m}$$
$$= (6x + 30)\ \text{m}$$
$$ST = \frac{1}{3}PQ$$
$$= \frac{1}{3}(6x + 30)\ \text{m}$$
$$= (2x + 10)\text{m}$$

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

We have been working on the solution of problems involving algebraic expressions and linear equations and inequalities in one variable. We have also worked on identifying and applying relationships of angles at a point and on a straight line, among angles formed by parallel lines cut by a transversal, and among the parts of a circle. Today, we are going to consolidate this work through the use of associated concepts, strategies, and techniques in the solution of some further such problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms that we have met in the previous five lessons that are most relevant to this lesson are:

alternate, chord, co-interior, corresponding, diameter, inscribed angle, linear equation, parallel, radius, solve, straight angle, transversal, vertically opposite.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

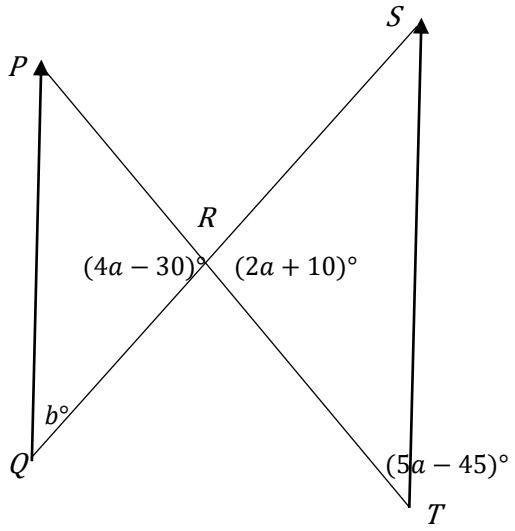
Part 4A

Stem for Items 1 and 2

Chloe is an interior designer. She is exploring relationships between angles and lines in some of her recent designs.

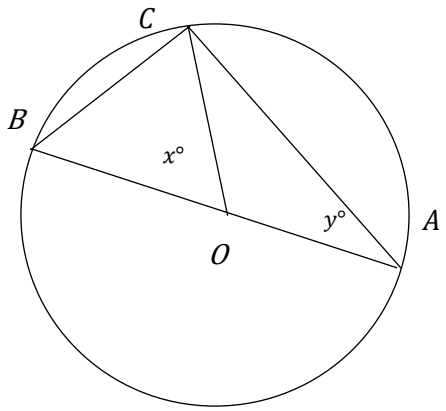
The diagrams below show parts of Chloe's designs.

Diagram 1



In Diagram 1, all are line segments and $PQ||ST$.

Diagram 2



In Diagram 2, O is the center of the circle and all the lines inside the circle are straight lines. $\angle BOC = x°$, $\angle OAC = y°$, and $\overline{OB} = (x - 25)$ meters.

Part 4B

Item 1

Questions

1. In Diagram 1, use $\angle PRQ$ and $\angle SRT$ to show that the value of a is 20.
2. Use the result in 1. to write down the size of $\angle STR$.
3. (Optional) Find the value of b.

Answers to Item 1

1. $\angle PRQ = \angle SRT$ (vertically opposite angles)

   $4a - 30 = 2a + 10$

   $2a = 40$

   $a = 20$

2. $\angle STR = 55°$

3. $b = 75$

Part 4C

Item 2

Questions

1. Write down the lengths of $OC, OA,$ and AB in Diagram 2, in terms of x.
2. If $BC = \frac{1}{2}AB$, what types of triangle are triangle OBC and triangle AOC?
3. (Optional) Write down the values of x, y, and the lengths of $OC, OA,$ and AB.

Answers to Item 2

1. $OC = (x - 25)$ m, $OA = (x - 25)$ m, $AB = (2x - 50)$ m
2. Triangle OBC is equilateral; Triangle AOC is isosceles.
3. $x = 60, y = 30, OC = OA = 35$ m, $AB = 70$ m

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 13

Solving Problems involving Sides and Angles of a Polygon

Key Idea

Solve problems involving sides and angles of a polygon.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

Read each statement carefully and fill-in the blanks with the correct answer.

1. A regular polygon has equal sides, equal …… angles, and equal exterior angles.
2. The formula $\frac{360^\circ}{n}$, where n is the number of sides of the polygon, gives the measure of each …… angle of a regular polygon.
   This measure for a regular polygon with 4 sides (i.e., a 'square') is …… degrees.
3. A triangle is a three-sided polygon.
   A triangle with 2 equal sides is called a/an …… triangle.
   A triangle with 3 equal sides is called a/an …… triangle.

Answers

1. interior
2. exterior; 90
3. isosceles; equilateral

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

We can use what we have learned in our study of geometry to help us solve real-life problems. Today we will use sides and angles of polygons in finding the solutions to such problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are:

bisect, exterior angle, hexagon, interior angle, pentagon, regular polygon.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

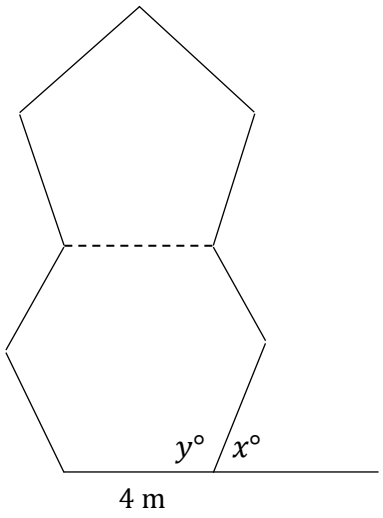
Part 4A

Stem for Items 1 and 2

Chris is building a new garden. He knows that each exterior angle of a regular polygon measures $\frac{360^\circ}{n}$, where n is the number of sides of the polygon.

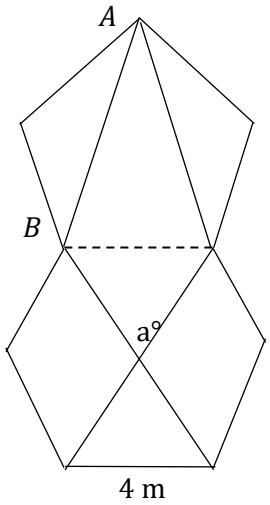
He starts by marking on the ground a regular hexagon of side length 4 meters and completes the design by adding a regular pentagon as shown in Diagram 1.

Diagram 1



Chris then decides to create 7 separate garden beds, including 5 triangular beds, by adding some interior straight borders to his design, as shown in Diagram 2. He knows that the diagonal borders in the hexagonal part of the garden bisect the interior angles of the hexagon.

Diagram 2



Part 4B

Item 1

Questions

By considering Diagram 1:

1. Find the size of each exterior angle $(x°)$ and of each interior angle $(y°)$ of the hexagon.
2. Find the length of the timber edging needed for the outside border of the whole garden.
3. (Optional) Find the sum of all the interior angles of the garden.

Answers to Item 1

1. $x° = 60°$

   $y° = 120°$
2. 36 m
3. $1260°$

Part 4C

Item 2

Questions

By considering Diagram 2:

1. What type of triangle are the three triangular beds within the pentagonal part of the garden?
2. Find the value of a and the type of triangle inside the hexagonal part of the garden.
3. Chris has measured the new interior border AB to be $6.5\ \text{m}$.

   Calculate the total length of timber edging needed for all the new interior borders of the garden.

Answers to Item 2

1. isosceles
2. $a = 60$; equilateral
3. $29\ \text{m}$

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 14

Organizing Data in Tables and Using Appropriate Graphs to represent Organized Data

Key Idea

Organize data in tables and use appropriate graphs to represent organized data.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

1. What types of graphs:
   (i) should have columns or bars of the same width, an appropriate title, and clearly labeled and scaled axes?
   (ii) have no axes and consist of a circle divided into sectors in proportion to each quantity?
2. What types of tables show each of the scores in a data set and the number of times ('frequency') that each of the scores occurs?
3. What are the special column graphs, with no gaps between the columns, that show each of a set of scores on the horizontal axis and the frequency of the scores on the vertical axis?

Answers

1. (i) column or bar graph
   (ii) pie chart
2. frequency distribution table
3. (frequency) histogram

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

In a broad range of workplaces and roles, people work with different types of information, or 'data', that will assist them to answer many important questions. Today, we will use what we have learned in our study of statistics about tables and graphs to help us answer different questions about some statistical data.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are:

axis, bar graph, column graph, frequency, histogram, horizontal and vertical axes.

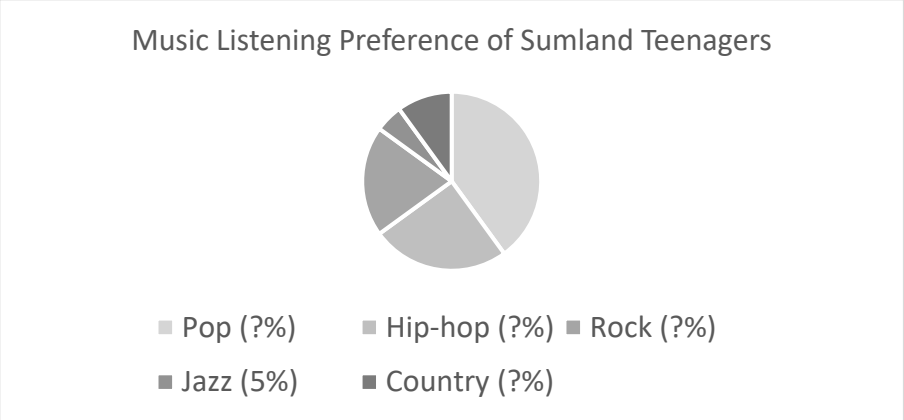
Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

Stem for Items 1 and 2

A survey of teenagers in Sumland was conducted recently to find their main listening preference among five types of music: Pop, Hip-hop, Rock, Jazz, and Country. The pie chart below was drawn to represent the findings of the survey.



From the data and construction of the pie chart it is known that:

- the sector angle in the pie chart for Hip-hop is $90°$
- Country is twice as popular as Jazz as a main listening preference.

Following the survey, all the teenage students in Class 7R in a school in Sumland recorded the number of hours of music of all types that they listened to on a particular weekend. The hours recorded were:

$$2, 1, 0.5, 0, 3, 1.5, 2.5, 1, 0.5, 0, 2, 1.5, 1.5, 2, 0, 1, 0.5, 2, 4, 1, 0, 3.5, 3, 2$$

Part 4B

Item 1

Questions

1. (i) What percentage of the Sumland teenagers surveyed gave Hip-hop as their main listening preference?

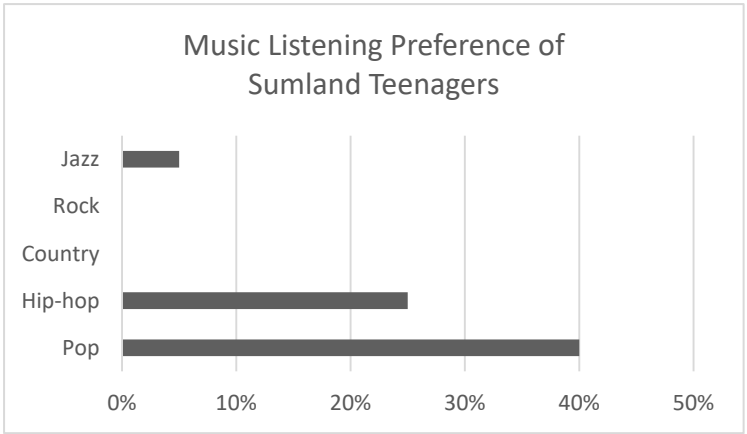
   (ii) If Pop is eight times more popular than Jazz, are Rock and Country together more or less popular than Hip-hop?

2. Do we know from the pie chart how many Sumland teenagers were surveyed? Explain your answer.

3. You are asked to complete a bar graph of the same data. If 1 unit represents 5% on the horizontal axis, how many units long do you need to draw the bar for:

   (i) Rock?
   (ii) Country?

   Use your answers to complete the bar chart.



Answers to Item 1

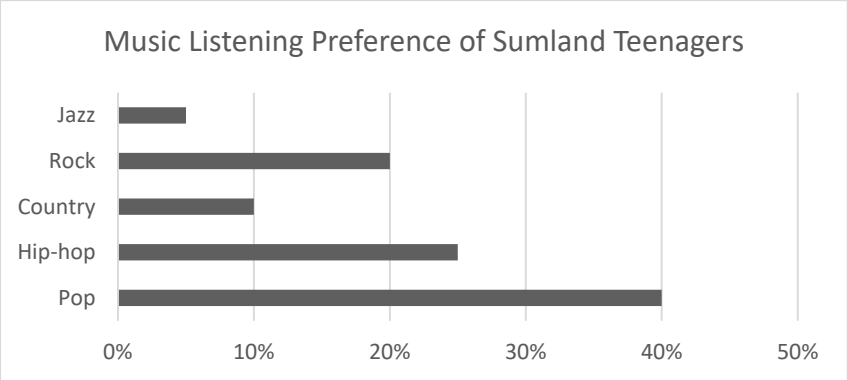
1. (i) 25%

   (ii) Rock and Country together are more popular (30% of those surveyed) than Hip-hop (25% of those surveyed) as a main listening preference.

2. No. This pie chart provides percentages only.

3. (i) Rock: 4 units

   (ii) Country: 2 units.



Part 4C

Item 2

Questions

1. Complete the frequency distribution table below to represent the data for Class 7R.

Score (hours listening to music)	Tally	Frequency
0		
0.5		
1		
1.5		
2		
2.5		
3		
3.5		
4		

2. (i) What was the most common number of hours that these students were listening to music?

   (ii) How many students are in Class 7R?

   (iii) How many students were listening to music for: 2.5 hours or more?; for 1 hour or less?

3. Draw a frequency histogram to display the data in the frequency distribution table. (Remember to include a scale and title on each of the horizontal and vertical axes, as well as a title for the histogram.)

Answers to Item 2

1.

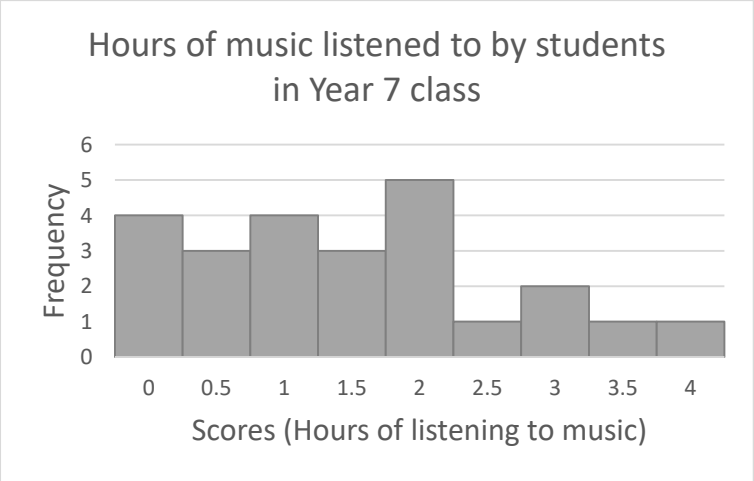
Score (hours listening to music)	Tally	Frequency
0	||||	4
0.5	|||	3
1	||||	4
1.5	|||	3
2	~~||||~~	5
2.5	|	1
3	||	2
3.5	|	1
4	|	1

2. (i) 2 hours

   (ii) 24 students

   (iii) 5 students; 11 students

3.



Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 15

Calculating the Measures of Central Tendency of Ungrouped Data

Key Idea

Calculate the measures of central tendency of ungrouped data.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

1. For the set of scores $0, 1, 2, 5, 6, 6, 8$, find:
   (i) the mean (the average score)
   (ii) the median (the middle score)
   (iii) the mode (the most common score)
2. For the set of scores $12, 11, 13, 10, 12, 11$, find:
   (i) the median
   (ii) the mode(s)

Answers

1. (i) Mean $= 4$
   (ii) Median $= 5$
   (iii) Mode $= 6$
2. (i) Median $= 11.5$
   (ii) Modes are 11 and 12

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

In particular roles, people work with specific data that will assist them to answer important questions for their communities. Today, we will use what we have learned in our study of statistics about measures of central tendency to help us explore different questions about traffic volume and flow in one such community.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are:

cumulative frequency, data, frequency, frequency distribution, mean/median/mode, score.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

Stem for Items 1 and 2

Sunny is investigating traffic volume and flow in her hometown. At Intersection *A* she records the number of cars passing the intersection each minute for 20 minutes. She then arranges the data in increasing order of size:

0, 0, 1, 1, 2, 3, 3, 3, 3, 3, 4, 4, 4, 5, 5, 6, 6, 6, 6, 7

At Intersection *B*, Sunny also records the number of cars passing the intersection each minute for 20 minutes. She then enters the data in a frequency distribution table:

Number of cars passing Intersection B each minute x	Frequency f	$f \times x$	Cumulative Frequency
4	3		
5	6		
6	4		
7	3		
8	3		
9	1		
	$\sum f =$	$\sum(f \times x) =$	

Part 4B

Item 1

Questions

1. What is the mode number of cars passing Intersection *A* each minute?
2. (i) Calculate the median number of cars passing Intersection *A* each minute.

   (ii) Calculate the mean number of cars passing Intersection *A* each minute.
3. Sunny also counts the number of cars passing Intersection *A* for each of the next 5 minutes and records 4, $2, 4, 6$ and 4 cars.

   (i) (Optional) What will be the new mode and median?

   (ii) (Optional) Without calculating the new mean score, explain why it will be higher than the mean obtained in 2 (ii).

Answers to Item 1

1. Mode $= 3$
2. (i) Median $= 3.5$

   (ii) Mean $= 3.6$
3. (i) The new mode is 4.

   The new median is 4.

   (ii) The new mean will be higher because the mean of the 5 additional scores is 4, which is higher than the mean of the first 20 scores (3.6), found in 2(ii).

Part 4C

Item 2

Questions

1. Read from the table the mode number of cars passing Intersection *B* each minute.
2. Complete the $f \times x$ column of the table and find the mean of the scores using the formula

   Mean $= \frac{\sum(f \times x)}{\sum f}$.
3. Complete the Cumulative Frequency column of the table to find the median of the set of scores.

Answers to Item 2

1. Mode $= 5$

   The completed table for answering Questions 2 and 3 is shown below.

Number of cars passing Intersection B each minute x	Frequency f	$f \times x$	Cumulative Frequency
4	3	12	3
5	6	30	9
6	4	24	13
7	3	21	16
8	3	24	19
9	1	9	20
	$\sum f=20$	$\sum(f \times x)=120$	

2. Mean $= 6$
3. Median $= 6$

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 16

Calculating the Range and Standard Deviation of Ungrouped Data

Key Idea

Calculate the range and standard deviation of ungrouped data.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

For the set of scores: $1, 2, 2, 2, 3, 3, 4, 4, 4, 5$

1. Write down the lowest score, the highest score, and the range.
2. (i) Write down the frequency of each score and the total frequency.
   (ii) Show that the mean for the set of scores is $\bar{x} = 3$.
3. (i) For each different score, write down its deviation (d) from the mean.
   (ii) Calculate the squares of each of the deviations.

Answers

1. Lowest score $= 1$, Highest score $= 5$, Range = Highest score – Lowest score $= 5 - 1 = 4$
2. (i)

Score	1	2	3	4	5
Frequency	1	3	2	3	1

Total frequency $= 10$

(ii) Mean $(\bar{x}) = \frac{\text{sum of scores}}{\text{number of scores}}$

$= \frac{1+2+2+2+3+3+4+4+4+5}{10}$

$= 3$

3. (i) and (ii)

Score	1	2	3	4	5
Deviation (d) from mean	-2	-1	0	1	2
d^2	4	1	0	1	4

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

In particular roles, people work with specific data that will assist them to answer important questions for their communities. Today, we will use what we have learned in our study of statistics about range and standard deviation to help us explore different questions about population data in one such community.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are:

deviation, population, range, square, standard deviation, survey.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

Stem for Items 1 and 2

Charles has a job collecting local population data. He conducts a survey of forty families in a nearby area to collect data on the number of children per household.

He lists the data obtained as:

$$1, 2, 4, 2, 1, 3, 3, 2, 2, 6, 2, 5, 2, 6, 4, 2, 4, 7, 5, 3, 1, 5, 3, 5, 2, 0, 2, 1, 4, 1, 3, 2, 6, 3, 3, 0, 3, 4, 2, 4$$

and enters the data into a frequency distribution table:

Number of children per household x	Frequency f	$f \times x$	d	d^2	$f \times d^2$
0	2	0			
1	5	5			
2	11	22			
3	8	24			
4	6	24			
5	4	20			
6	3	18			
7	1	7			
	$\sum f=40$	$\sum(f \times x) =120$			$\sum(fd^2) =$

Charles conducts a second survey of twenty more families in another local area to collect further data on the number of children per household. He enters the data obtained in the table:

Number of children per household x	0	1	2	3	4	5
Frequency f	1	8	5	3	2	1
$f \times x$						

Part 4B

Item 1

Questions

1. Write down the range of the data from the first survey.
2. Use the formula Mean $(\bar{x}) = \frac{\sum(f \times x)}{\sum f}$ to show that the mean for the data is $\bar{x} = 3$.
3. (i) Complete Columns 4 (using $\bar{x} = 3$), 5 and 6 of the table for the first survey.
   (ii) Calculate the standard deviation for the data.

Answers to Item 1

1. Range $= 7$
2. Mean $(\bar{x}) = \frac{\sum(f \times x)}{\sum f}$

$$= \frac{120}{40}$$

$$= 3$$

3. (i)

Number of children per household x	Frequency f	$f \times x$	d	d^2	$f \times d^2$
0	2	0	−3	9	18
1	5	5	−2	4	20
2	11	22	−1	1	11
3	8	24	0	0	0
4	6	24	1	1	6
5	4	20	2	4	16
6	3	18	3	9	27
7	1	7	4	16	16
	$\sum f$=40	$\sum(f \times x)$ =120			$\sum(fd^2) = 114$

(ii) Standard deviation ≅ 1.69

Part 4C

Item 2

Questions

1. Write down the range of the data from the second survey.
2. Use the formula Mean $(\bar{x})$ = $\frac{\sum(f \times x)}{\sum f}$ to show that the mean for the data is $\bar{x} = 2$.
3. (Optional) Charles calculates the standard deviation for the data from the second survey to be 1.26.
   (i) What percentage of the scores are within 1 standard deviation of the mean?
   (ii) What percentage of the scores are within 2 standard deviations of the mean?

Answers to Item 2

1. Range $= 5$
2. Mean $(\bar{x}) = \frac{\sum(f \times x)}{\sum f}$
   $= \frac{40}{20}$
   $= 2$
3. (i) 80% of scores
   (ii) 95% of scores

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
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- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

Mathematics Grade 7 Lesson Plan 17

Using Appropriate Statistical Measures in Analyzing and Interpreting Statistical Data

Key Idea

Use appropriate statistical measures in analyzing and interpreting statistical data.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

1. In the last six class quizzes in Mathematics, Jack and Jill have obtained the following scores:

   Jack: $7, 6, 8, 7, 5, 6$

   Jill: $8, 7, 6, 9, 1, 7$

   (i) What is the mean score for Jack and for Jill?

   (ii) What is the median of Jack's scores and of Jill's scores?

   (iii) Which measure gives a better indication of their abilities in Mathematics?

2. Yasmin manages a clothing store that sells ready-made men's suits. She has recorded in the table below the number of suits sold in the available sizes in the previous month.

Suit size	30	32	34	36	38
Number of suits sold	1	3	12	8	8

   For these scores, the mean is approximately 35.2, the median is 35, and the mode is 34.

   Which measure will give Yasmin the best indication of the size for which there is the greatest demand?

Answers

1. (i) Mean of Jack's scores $= 6.5$

   Mean of Jill's scores $\cong 6.3$

   (ii) Median of Jack's scores $= 6.5$

   Median of Jill's scores $= 7$

   (iii) The median, as Jill's mean was reduced by one poor result.

2. Mode

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

We can use what we have learned about measures of central tendency to help us solve real-world problems. Today, we will use these measures to analyze and interpret data in finding the solutions to such problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms are: analyze, central tendency, interpret, statistical data, statistical measure.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

Stem for Items 1 and 2

Sarah is a member of a team of men and women who play a popular outdoor sport. Each member of the team can contribute to the team's total score in a match.

Sarah's scores in the team's last eight matches have been: $32, 37, 27, 35, 40, 28, 37, 44$

Dylan is a member of the same team. His scores in the team's last eight matches have been:

$18, 52, 0, 18, 95, 15, 38, 60$

Part 4B

Item 1

Questions

1. For Sarah's scores, find the (i) mean, (ii) median, and (iii) mode.
2. The team coach is assessing her performance over the eight matches. Which of the three measures should the coach use?
3. If able to use any one of the three measures when describing the quality of her performance to others, which one would Sarah be likely to use?

Answers to Item 1

1. (i) Mean $= 35$

   (ii) Median $= 36$

   (iii) Mode $= 37$
2. The coach needs to know Sarah's average score to assess her performance. Therefore, the coach should use the mean.
3. Sarah would be likely to use the mode, as it is the highest of the three measures.

Part 4C

Item 2

Questions

1. For Dylan's scores, find the (i) mean, (ii) median, and (iii) mode.

   How does each of these measures for Dylan compare to those of Sarah?
2. If able to use any one of the three measures when describing the quality of his performance to others, which one would Dylan be likely to use?
3. The team coach is also assessing Dylan's performance over the eight matches. If only one of the players can be selected for the next match, which one should the coach choose on the basis of the measures?

Answers to Item 2

1. (i) Mean $= 37$
   (ii) Median $= 28$
   (iii) Mode $= 18$

   Dylan's mean is higher, his median is lower, and his mode is lower.
2. Dylan would use the mean, as it is the highest of the three measures.
3. The coach should choose Sarah. Even though the mean for her scores is a little lower than that for Dylan's scores, Sarah is the more consistent player.

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
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Mathematics Grade 7 Lesson Plan 18 Deliberate Practice

Organizing Data in Tables and Using Appropriate Graphs to represent Organized Data
Calculating the Measures of Central Tendency of Ungrouped Data
Calculating the Range and Standard Deviation of Ungrouped Data

Key Ideas

Organize data in tables and use appropriate graphs to represent organized data.
Calculate the measures of central tendency of ungrouped data.
Calculate the range and standard deviation of ungrouped data.

Lesson Component 1 (Lesson Short Review)

Time: 7 minutes

Questions

1. For the set of scores: $15, 17, 16, 20, 16, 18$, find the mean, median, mode, and range.
2. For the set of scores: $4, 6, 0, 4, 1$

   (i) List the scores in the table and complete the Frequency, $f \times x$ and Cumulative Frequency columns.

Score x	Frequency f	$f \times x$	Cumulative Frequency
	$\sum f =$	$\sum (f \times x) =$	

   (ii) Show that the mean for the set of scores is $\bar{x} = 3$.

3. Complete the columns for the deviation from the mean, the square of the deviation, and the frequency × the square of the deviation.

Score x	Frequency f	d	d^2	fd^2

Answers

1. Mean $= 17$

   Median $= 16.5$

   Mode $= 16$

   Range $= 5$

2. (i)

Score x	Frequency f	$f \times x$	Cumulative Frequency
0	1	0	1
1	1	1	2
4	2	8	4
6	1	6	5
	$\sum f = 5$	$\sum(f \times x) = 15$	

(i) Mean $= \frac{\sum(f \times x)}{\sum f}$

$= \frac{15}{5}$

$= 3$

3.

Score x	Frequency f	d	d^2	fd^2
0	1	-3	9	9
1	1	-2	4	4
4	2	1	1	2
6	1	3	9	9

Lesson Component 2 (Lesson Purpose/Intention)

Time: 3 minutes

Teacher states:

We have been working on the solution of problems involving the representation of data in tables and graphs, and measures of central tendency, range and standard deviation of ungrouped data. Today, we are going to consolidate this work through the solution of such problems.

Lesson Component 3 (Lesson Language Practice)

Time: 5 minutes

Key words/terms that we have met in the previous four lessons that are most relevant to this lesson are:

analyze, cumulative frequency, data, deviation, frequency, frequency distribution, mean/median/mode, range, score, standard deviation, survey.

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

<u>Stem for Items 1 and 2</u>

A survey of Olivia's class was conducted recently to find the number of pets in each student's household. The numbers of pets recorded were:

$$2, 3, 1, 0, 1, 2, 2, 5, 4, 3, 1, 6, 2, 1, 3, 0, 0, 1, 2, 4, 5, 1, 0, 2, 1, 3, 0, 1$$

Olivia wants to analyze the data and has partly completed the table below:

Number of pets per household x	Tally	Frequency f	$f \times x$	Cumulative Frequency	d	d^2	fd^2
0	𝍸	5					
1	𝍸|||	8					
2	𝍸|	6					
3	||||	4					
4	||	2					
5	||	2					
6	|	1					
		$\sum f =$	$\sum(f \times x) =$				$\sum(f\,d^2) =$

Part 4B

Item 1

Questions

1. (i) How many students are in Olivia's class?

   (ii) What is the mode number of pets per household?

2. Complete the $f \times x$ column of the table and find the mean number of pets per household using the formula Mean $= \frac{\sum(f \times x)}{\sum f}$.

3. Complete the Cumulative Frequency column of the table to find the median number of pets per household.

Answers to Item 1

1. (i) 28

   (ii) Mode $= 1$

2.

Number of pets per household x	Tally	Frequency f	$f \times x$
0	𝍸	5	0
1	𝍸|||	8	8
2	𝍸|	6	12
3	||||	4	12
4	||	2	8
5	||	2	10
6	|	1	6
		$\sum f = 28$	$\sum(f \times x) = 56$

Mean $= 2$

3.

Number of pets per household x	Tally	Frequency f	Cumulative Frequency
0	𝍸	5	5
1	𝍸 |||	8	13
2	𝍸 |	6	19
3	||||	4	23
4	||	2	25
5	||	2	27
6	|	1	28
		$\sum f=28$	

Median $= 2$

Part 4C

Item 2

Questions

1. Write down the range for the data.
2. (i) Complete Columns 6 (using $\bar{x} = 2$), 7 and 8 of the table for the survey.
   (ii) Show that the standard deviation for the data is approximately 1.63.
3. (Optional) What percentage of the scores are within 1 standard deviation of the mean?

Answers to Item 2

1. Range $= 6$
2. (i)

Number of pets per household x	Frequency f	$d = x - \bar{x}$	d^2	fd^2
0	5	−2	4	20
1	8	−1	1	8
2	6	0	0	0
3	4	1	1	4
4	2	2	4	8
5	2	3	9	18
6	1	4	16	16
	$\sum f=28$			$\sum(fd^2)=74$

(ii) Standard deviation $= \sqrt{\frac{\sum(fd^2)}{\sum f}}$

$$= \sqrt{\frac{74}{28}}$$

$$\cong 1.63$$

3. approx. 64%.

Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Time: 5 minutes

The teacher facilitates student reflection and discussion that address such questions as:

- What do you think were the key mathematical concepts addressed in this lesson?
- Would you rate your level of understanding of the material covered in this lesson as high, moderate, or low?
- Has the lesson helped you gain further insight into aspects of the material covered that represent strengths or represent weaknesses?
- What would you describe as the main barriers, if any, to your ongoing progress and achievement in relation to the topic area addressed in this lesson?
- What do you think would best assist your ongoing progress and achievement in relation to the topic area?

For inquiries or feedback, please write or call:

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