7

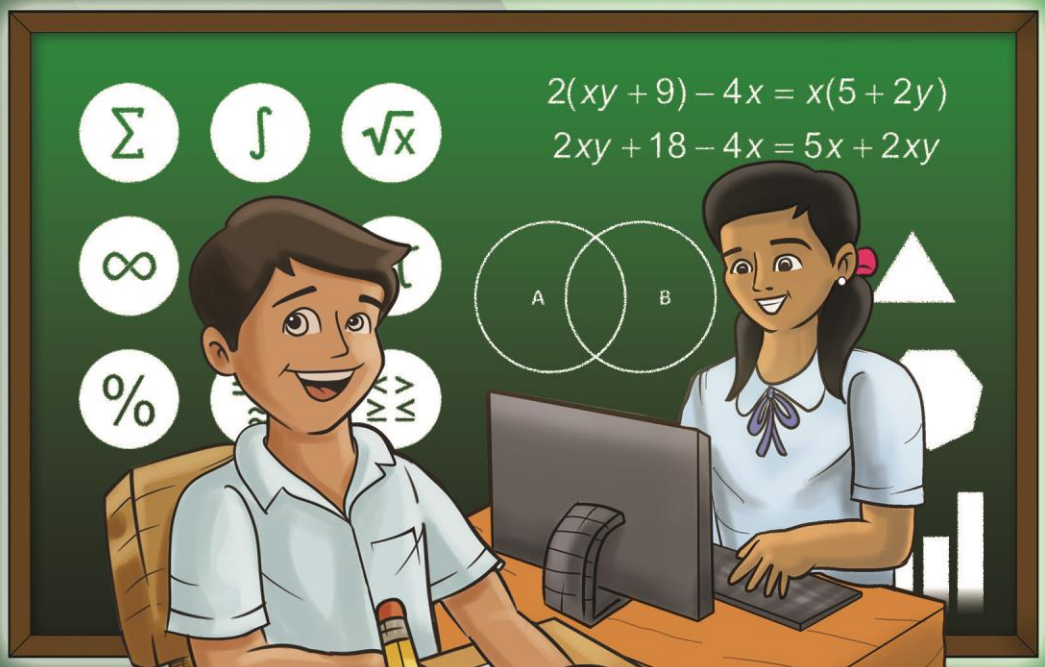
NATIONAL LEARNING CAMP

DepED DEPARTMENT OF EDUCATION

Mathematics

Enhancement Learning Camp

Student Workbook



Enhancement Learning Camp

Mathematics Grade 7

Student Workbook

Weeks 1 to 3

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Introduction for Students

Welcome to the National Learning Camp. You are probably aware that this Camp is only open to students like you who have just completed Grade 7 or Grade 8 across the country.

You have chosen to be part of this important national program. Our focus this year is on: English, Mathematics, and Science.

The Plan

You are to attend school on three days each week: Tuesday, Wednesday, and Thursday.

You will take part in six special lessons each day. These lessons review subject content you have completed. This will help you further strengthen your learning.

There will be opportunities in each lesson for you to practice talking with other students and your teacher, and applying the knowledge you have gained in:

- understanding (comprehending) what you are reading in *English*,
- solving *Mathematics* problems, and
- interpreting the natural world through applying *Science* evidence.

Time in Class

How you use your time in lessons is very important. Every minute is valuable. It is critical that you work with the teacher and your classmates as closely as you can.

This means you will be expected to:

- start each lesson as quickly as possible,
- recognize the lesson pattern and help the teacher as you move from one part of the lesson to another,
- pay attention when the teacher or students in your class are talking about work, and
- try your best with all the different activities that make up the lesson.

You will have opportunities to write your answers down, explain to the teacher or classmates your reasons for your responses or thinking. There will be time to work on your own and at other times you will work with your classmates and report to the class.

Mistakes

One important fact drawn from brain research on learning concerns making mistakes. **It might surprise you!**

Making mistakes while learning and trying to improve your skills and understanding is *part of the brain's process*. So, learning from mistakes is an important pathway of our learning journey. When a genuine mistake is made:

- do not be ashamed or embarrassed,
- do try to learn from your mistake,
- be willing to talk about your mistakes,
- try to understand why you committed a mistake, and
- find out how to correct the mistake.

Too often learners are embarrassed or feel they have failed because of errors/mistakes. **This should not be the case.** Everyone makes mistakes as they learn new material – **everyone.**

A very famous scientist, Niels Bohr, who won a Nobel Prize for Physics, said:

An expert is a person who has made all the mistakes that can be made in a very narrow field.

Everyone makes mistakes, even experts. **It is a vital part of learning.** If you make mistakes, it is a sign that you are moving your learning forward. You may need to return to earlier learning and fill in some gaps.

Mistakes and/or errors tell **you** and your **teacher** about your thinking and where you need help or practice (we call it deliberate practice) to do better. The **teacher** and **you** should celebrate finding the mistake as it will help you both know what new learning is needed.

You might be surprised, but if you do not make genuine mistakes and fix them, your learning will not move forward efficiently.

Practice

If you want to be good at something you must practice it. Practice alerts the brain that the information needs to be known and to store the information in your head.

This is the way the brain works; this is the way the brain learns. Learning, anything from sport, about your peers, and to learning subjects in school, requires effort and that means practice.

Effort requires persistence, but it is not supposed to be difficult and punishing. It may be continued until one learns. There are no tricks. This is what the brain needs to learn.

It is important that you try and try again

Learning is a competition with yourself, not others. It is recognizing how your effort results in showing you where and how you are doing better. To be as good as you can be will only be known if you try.

The Extensive Team of Educators and Teachers involved in the National Learning Camp wish you the very best in your education future. For the Learning Camp, and your work when you return to school, our hope is for you to take any new knowledge, skills and understandings you have acquired to learn more, and to use this knowledge to want to learn more.

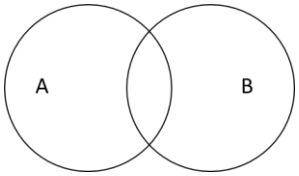
Best Wishes

Student Worksheet Mathematics Grade 7 Lesson 1

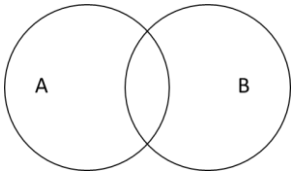
Solving Problems using Venn Diagrams

Lesson Component 1 (Lesson Short Review)

1. In the Venn diagram, shade the set:



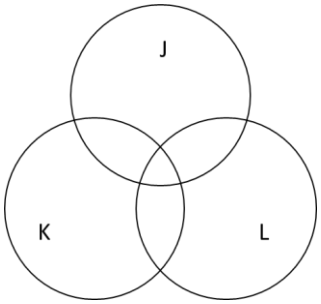
(i) $A \cap B$



(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 $(J \cap K) \cup (K \cap L)$.



Lesson Component 3 (Lesson Language Practice)

Key words/terms are:

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

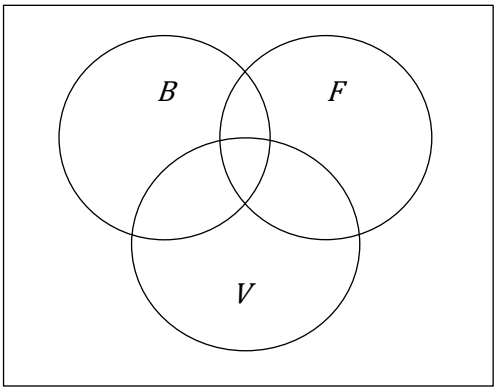
Lesson Component 4 (Lesson Activity)

Part 4A

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 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

1. (i) Show on the diagram the given information that 3 students play all 3 sports.

   (ii) Using this information and 3) above, 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.

Part 4C

Item 2

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. How many students then play exactly two of the three sports?

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

Student Worksheet Mathematics Grade 7 Lesson 2

Performing the Four Operations on Integers and Fractions

Lesson Component 1 (Lesson Short Review)

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?

   (iii)

Lesson Component 3 (Lesson Language Practice)

Key words/terms are:

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

Lesson Component 4 (Lesson Activity)

Part 4A

Maria and Juan are playing a game, 'Numerical', 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 winner is the first player to end a turn on their pre-nominated 'Home square'.

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)

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. 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'?

Part 4C

Item 2 (Game 2)

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. 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'?

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

Student Worksheet Mathematics Grade 7 Lesson 3

Solving Problems involving Real Numbers

Lesson Component 1 (Lesson Short Review)

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.

Lesson Component 3 (Lesson Language Practice)

Key words/terms are:

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

Lesson Component 4 (Lesson Activity)

Part 4A

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 Student Worksheet 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

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. For the 2024 break-up of shares, what percentage of the company will:
   (i) James need to sell?

   (ii) Paul need to sell?

Part 4C

Item 2

1. Write the names of the three 2024 owners from youngest to oldest, using the information in 2) in Part 4A.

2. If Bella's age is taken to be x, write down James' and Paul's ages in terms of x.

3. How old are James, Paul, and Bella?

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

Student Worksheet Mathematics Grade 7 Lesson 4

Solving Problems involving Conversion of Units of Measurement

Lesson Component 1 (Lesson Short Review)

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

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

Lesson Component 3 (Lesson Language Practice)

Key words/terms are:

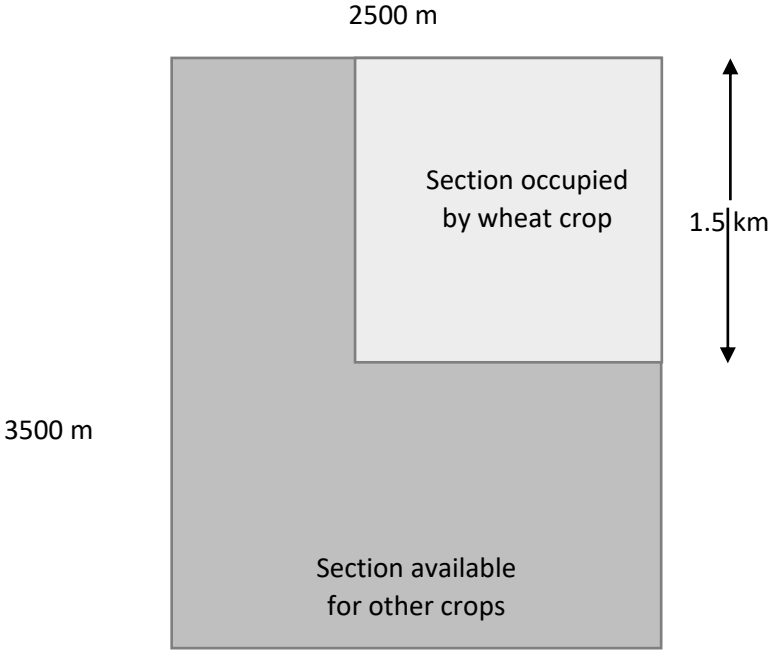
conversion, cubic meter, hectare, rectangular, rectangular prism, tonne, unit, volume.

Lesson Component 4 (Lesson Activity)

Part 4A

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 work-day.



Part 4B

Item 1

1. In good weather, how many work-days will it take Jack to inspect all of the outside fencing?

2. How many kilometers will Jack drive along the outside fencing?

3. Jack needs to calculate the amount of space available in the paddock for other crops.

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

Part 4C

Item 2

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. If wheat weighs 800 kg per cubic meter, how many hopper cars were needed to transport Jack's wheat?

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

Student Worksheet Mathematics Grade 7 Lesson 5

Using Models and Algebraic Methods to find Algebraic Products

Lesson Component 1 (Lesson Short Review)

1. Expand
   (i) $x \times 2x$

   (ii) $2x \times 3y$

2. Simplify
   (i) $6x + 5x$

   (ii) $2ab - 9ab$

3. Expand
   (i) $2x(x + 2)$

   (ii) $(3x)^2$

   (iii) $2y(y^2 + 3y + 1)$

Lesson Component 3 (Lesson Language Practice)

Key words/terms are:

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

Lesson Component 4 (Lesson Activity)

Part 4A

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

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 $(2x - y)$?

Part 4C

Item 2

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

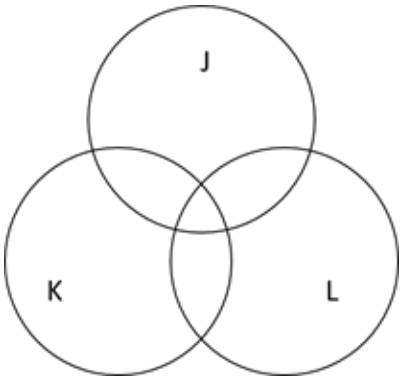
Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Student Worksheet Mathematics Grade 7 Lesson 6 Deliberate Practice

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

Lesson Component 1 (Lesson Short Review)

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 cubic meter $= 1000$ liters)

Lesson Component 3 (Lesson Language Practice)

Key words/terms that we have met in lessons this week 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)

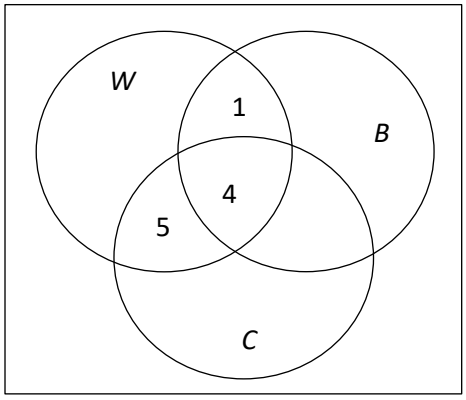
Part 4A

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)

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.

Part 4C

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

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?

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

Student Worksheet Mathematics Grade 7 Lesson 7

Solving Problems involving Algebraic Expressions

Lesson Component 1 (Lesson Short Review)

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.

Lesson Component 3 (Lesson Language Practice)

Key words/terms are:

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

Lesson Component 4 (Lesson Activity)

Part 4A

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

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.

Part 4C

Item 2

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?

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

Student Worksheet Mathematics Grade 7 Lesson 8

Solving Problems involving Linear Equations and Inequalities in One Variable

Lesson Component 1 (Lesson Short Review)

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.

   What inequation would represent this information?

Lesson Component 3 (Lesson Language Practice)

Key words/terms are:

consecutive, inequation, less than/greater than, linear equation, linear inequality, solve.

Lesson Component 4 (Lesson Activity)

Part 4A

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

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. If y is taken to be Amber's age, set up and solve another equation to find her age and Aunt Liz's age.

Part 4C

Item 2

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. Set up and solve an inequation to find the greatest age that Jane could be.

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

Student Worksheet Mathematics Grade 7 Lesson 9

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

Lesson Component 1 (Lesson Short Review)

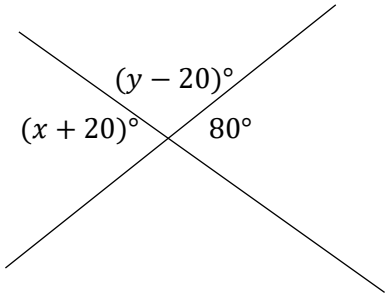
1. (i) Complete: An acute angle measures less than …… degrees.

   (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.

Lesson Component 3 (Lesson Language Practice)

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

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.

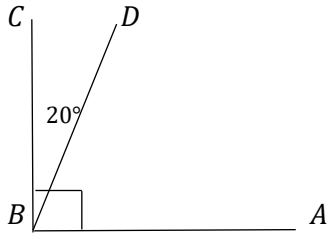


Diagram 2: shows three angles meeting at a point.

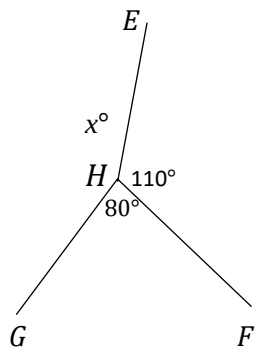


Diagram 3: shows two intersecting straight lines JK and LM.

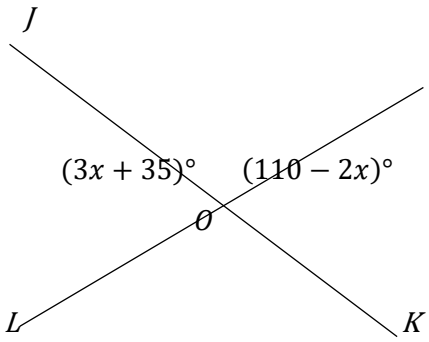


Diagram 4: shows two adjacent angles, $\angle PQS$ and $\angle SQR$, whose measures together make a straight angle.

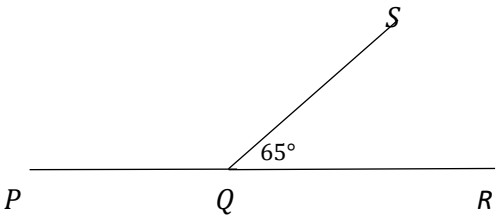


Diagram 5: shows angles meeting at the point Z. XY is a straight line.

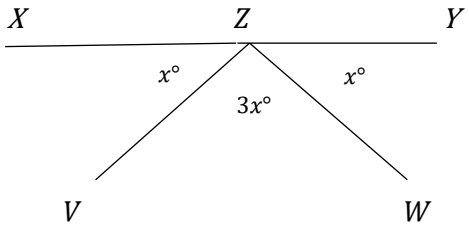
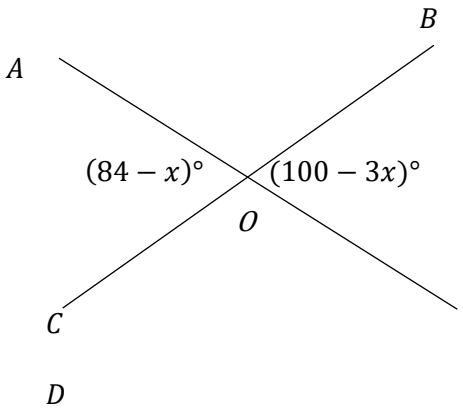


Diagram 6: shows two intersecting straight lines AD and BC.



Part 4B

Item 1

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

Part 4C

Item 2

1. (i) What type 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. In Diagram 6, find the size of each of the four angles.

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

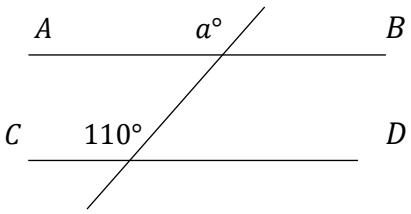
Student Worksheet Mathematics Grade 7 Lesson 10

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

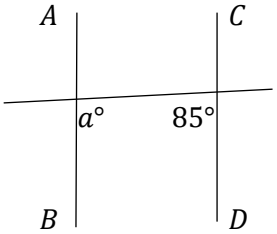
Lesson Component 1 (Lesson Short Review)

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 …….

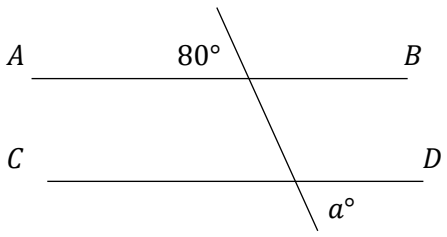
2. In the following diagrams, $AB||CD$. In each case, find the value of a, giving a reason or reasons.
   (i)



   (ii)



   (iii)



Lesson Component 3 (Lesson Language Practice)

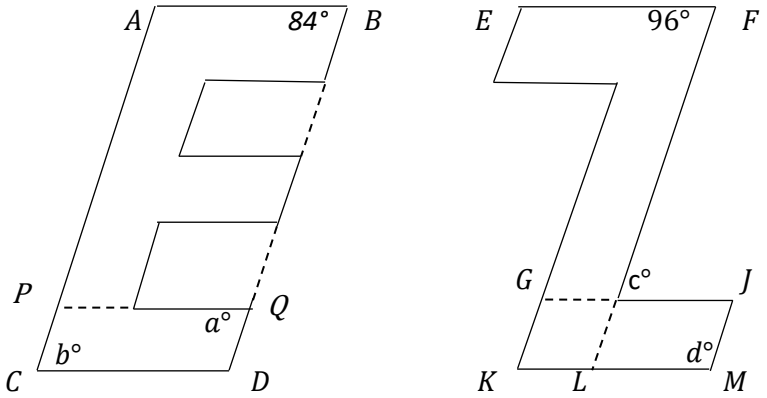
Key words/terms are:

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

Lesson Component 4 (Lesson Activity)

Part 4A

Diagram 1



** Please note that $a°$ corresponds to $\angle EFD$ and $b°$ corresponds to $\angle ACD$.*

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

All the lines in the logo:

- that run from left to right ('horizontal' lines) are parallel.
- 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.

Diagram 2

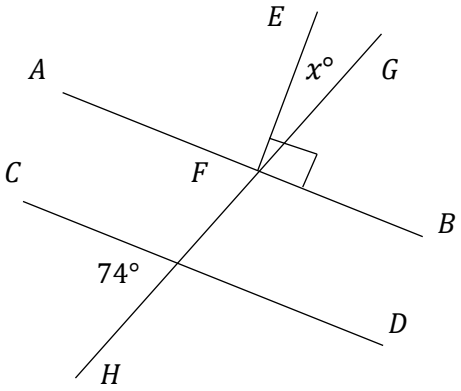
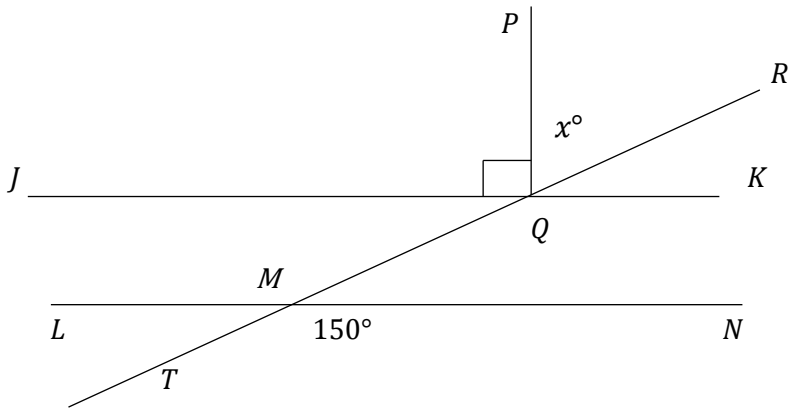


Diagram 3



Part 4B

Item 1

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.

Part 4C

Item 2

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.

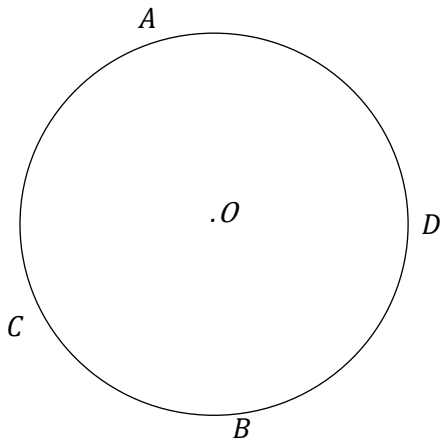
Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Student Worksheet Mathematics Grade 7 Lesson 11

Identifying and Applying Relationships among the Parts of a Circle

Lesson Component 1 (Lesson Short Review)

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.

Lesson Component 3 (Lesson Language Practice)

Key words/terms are:

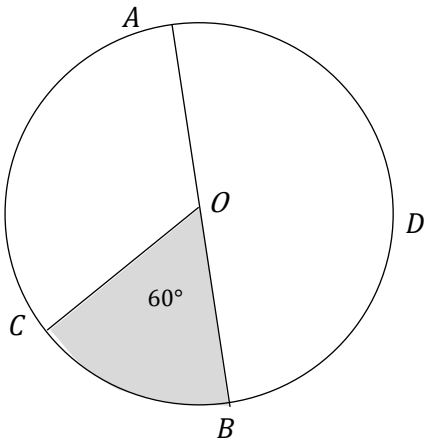
central angle, chord, circumference, diameter, inscribed angle, radius, semi-circle.

Lesson Component 4 (Lesson Activity)

Part 4A

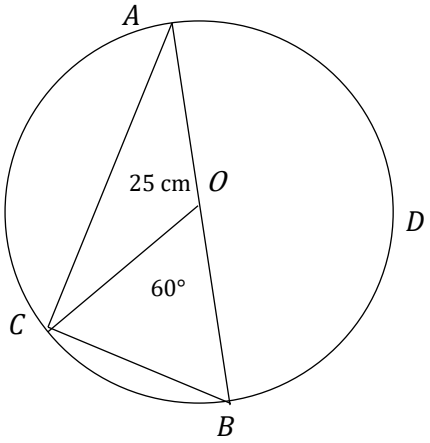
Carl is constructing designs using circles and related parts of circles. To create his designs, he needs to identify the various parts of circles used and relationships between them.

Diagram 1 (Design 1 part (a))



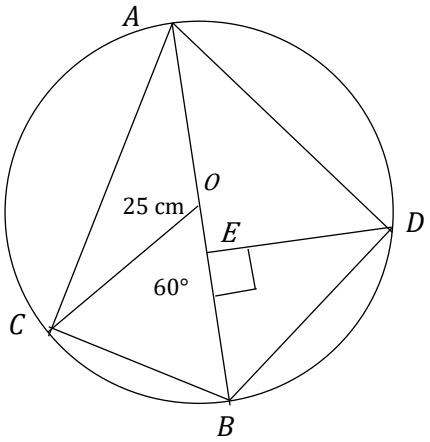
In Design 1 part (a), Carl has divided a circle into three parts. O is the center of the circle. A, B, C and D are points on the circumference of the circle. AB and OC are straight lines.

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

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. If using string to form the two smaller triangles in Design 1 part (b) (without forming OC twice), how much string will Carl need?

Part 4C

Item 2

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.

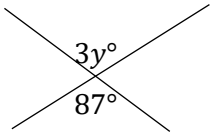
Lesson Component 5 (Lesson Conclusion – Reflection/Metacognition on Student Goals)

Student Worksheet Mathematics Grade 7 Lesson 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

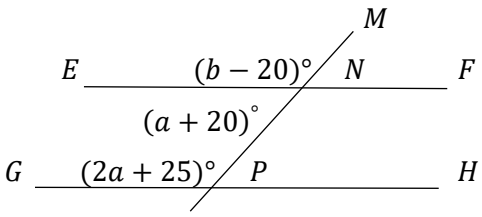
Lesson Component 1 (Lesson Short Review)

1.



Find the value of y and justify your answer.

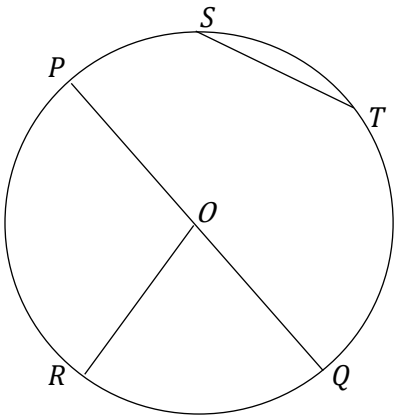
2. In the diagram, $EF||GH$.



…

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.

Lesson Component 3 (Lesson Language Practice)

Key words/terms that we have met in lessons this week 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.

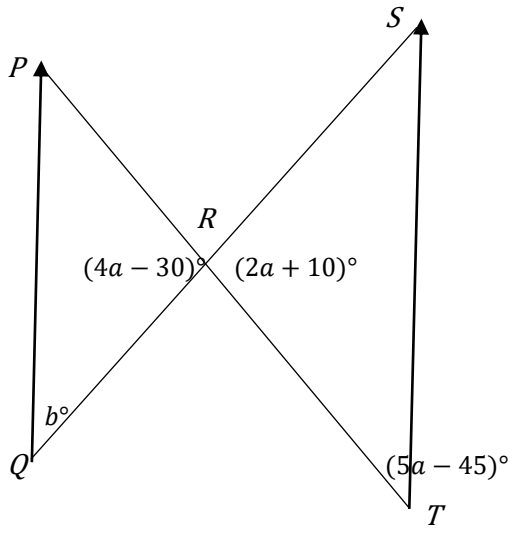
Lesson Component 4 (Lesson Activity)

Part 4A

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

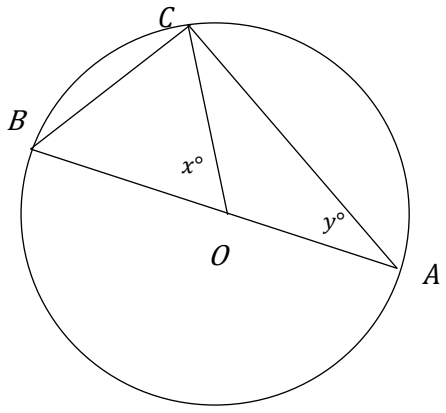
The diagrams below show parts of Chloe's designs.

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. $\angle BOC$ is $x°$, $\angle OAC$ is $y°$, and $\overline{OB} = (x - 25)$ meters.

Part 4B

Item 1

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. Find the value of b.

Part 4C

Item 2

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 type of triangle are triangle OBC and triangle AOC?

3. Write down the values of x and y, and the lengths of OC, OA and AB.

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

Student Worksheet Mathematics Grade 7 Lesson 13

Solving Problems involving Sides and Angles of a Polygon

Lesson Component 1 (Lesson Short review)

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 $\frac{360°}{n}$, 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.

Lesson Component 3 (Lesson Language Practice)

Key words/terms are:

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

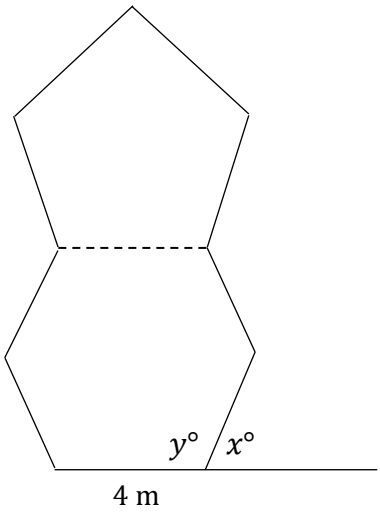
Lesson Component 4 (Lesson Activity)

Part 4A

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

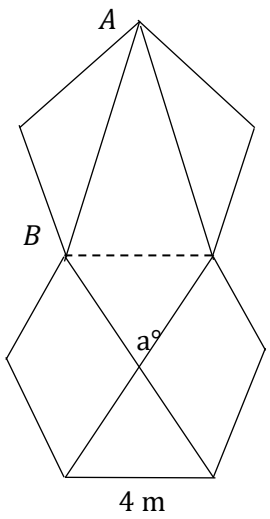
He starts by marking on the ground a regular hexagon of side length 4 meters and completes the design by adding a regular pentagon as shown in Diagram 1.

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

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. Find the sum of all the interior angles of the garden.

Part 4C

Item 2

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

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

Student Worksheet Mathematics Grade 7 Lesson 14

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

Lesson Component 1 (Lesson Short Review)

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?

Lesson Component 3 (Lesson Language Practice)

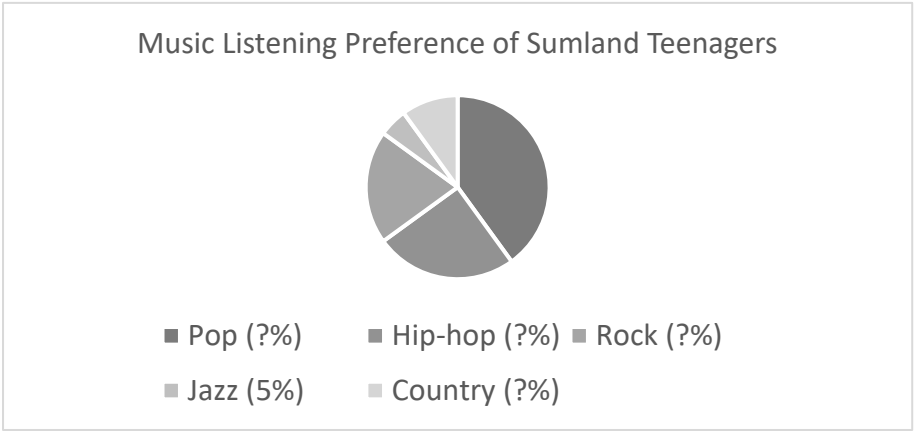
Key words/terms are:

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

Lesson Component 4 (Lesson Activity)

Part 4A

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

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

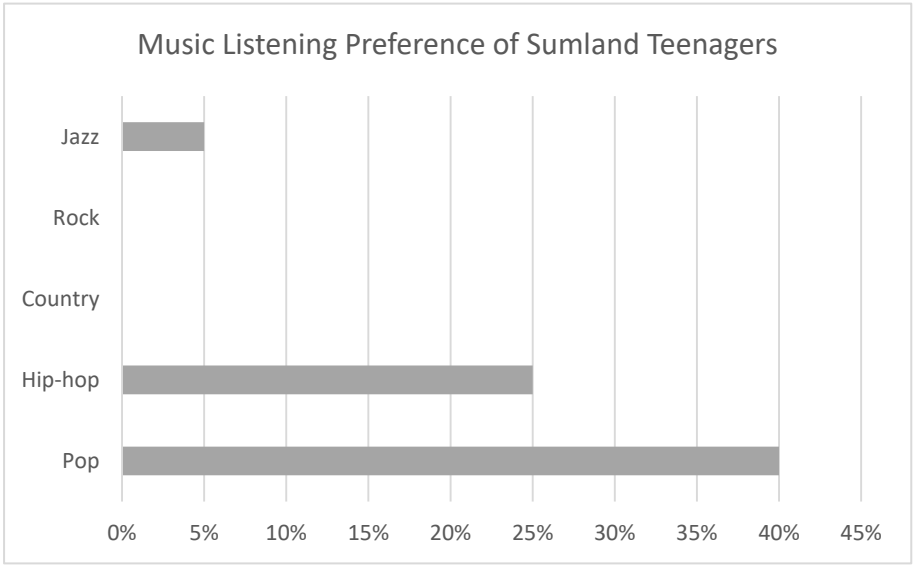
   (ii) If Pop is eight times more popular than Jazz, are Rock and Country together more or less popular than Hip-hop?

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.



Part 4C

Item 2

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.)

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

Student Worksheet Mathematics Grade 7 Lesson 15

Calculating the Measures of Central Tendency of Ungrouped Data

Lesson Component 1 (Lesson Short Review)

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)

Lesson Component 3 (Lesson Language Practice)

Key words/terms are:

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

Lesson Component 4 (Lesson Activity)

Time: 25 minutes

Part 4A

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	fx	Cumulative Frequency
4	3		
5	6		
6	4		
7	3		
8	3		
9	1		
	$\sum f =$	$\sum fx =$	

Part 4B

Item 1

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) What will be the new mode and median?

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

Part 4C

Item 2

1. Read from the table the mode number of cars passing Intersection B each minute.

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

2. Complete the $f \times x$ column of the table and find the mean of the scores using the formula

   $\text{Mean} = \frac{\sum f\,x}{\sum f}$

3. Complete the Cumulative Frequency column of the table to find the median of the set of scores.

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

Student Worksheet Mathematics Grade 7 Lesson 16

Calculating the Range and Standard Deviation of Ungrouped Data

Lesson Component 1 (Introduction to Lesson)

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.

Score					
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.

Score					
Deviation (d) from mean					
d^2					

Lesson Component 3 (Lesson Language Practice)

Key words/terms are:

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

Lesson Component 4 (Lesson Activity)

Part 4A

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

1. Write down the range of the data from the first survey.

2. Use the formula $\text{Mean } (\bar{x}) = \frac{\sum(f \times x)}{\sum f}$ 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.

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			$\sum(fd^2)$ =

(ii) Calculate the standard deviation for the data.

Part 4C

Item 2

1. Write down the range of the data from the second survey.

2. Use the formula $\text{Mean } (\bar{x}) = \frac{\sum(f \times x)}{\sum f}$ to show that the mean for the data is $\bar{x} = 2$.

3. 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?

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

Student Worksheet Mathematics Grade 7 Lesson 17

Using Appropriate Statistical Measures in Analyzing and Interpreting Statistical Data

Lesson Component 1 (Lesson Short Review)

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?

Lesson Component 3 (Lesson Language Practice)

Key words/terms are:

analyze, central tendency, interpret, statistical data, statistical measure.

Lesson Component 4 (Lesson Activity)

Part 4A

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

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?

Part 4C

Item 2

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 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?

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

Student Worksheet Mathematics Grade 7 Lesson 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

Lesson Component 1 (Lesson Short Review)

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

Lesson Component 3 (Lesson Language Practice)

Key words/terms that we have met in lessons this week 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)

Part 4A

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	fx	Cumulative Frequency	d	d^2	fd^2
0	𝍸	5					
1	𝍸 III	8					
2	𝍸 I	6					
3	IIII	4					
4	II	2					
5	II	2					
6	I	1					
		$\sum f =$	$\sum fx =$				$\sum(f\,d^2) =$

Part 4B

Item 1

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

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

2. Complete the fx column of the table and find the mean number of pets per household using the formula

   $$\text{Mean} = \frac{\sum f\,x}{\sum f}$$

Number of pets per household x	Tally	Frequency f	fx
0	𝍸	5	
1	𝍸 III	8	
2	𝍸 I	6	
3	IIII	4	
4	II	2	
5	II	2	
6	I	1	
		$\sum f = 28$	$\sum fx =$

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

Number of pets per household x	Tally	Frequency f	Cumulative Frequency
0	𝍸	5	
1	𝍸 III	8	
2	𝍸 I	6	
3	IIII	4	
4	II	2	
5	II	2	
6	I	1	
		$\sum f$=	

Part 4C

Item 2

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.

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

(ii) Show that the standard deviation for the data is approximately 1.63.

3. What percentage of the scores are within 1 standard deviation of the mean?

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

For inquiries or feedback, please write or call:

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