THE PRESIDENT'S RECOVERY PRIORITIES
Education

Ministry of Education, Science and Technology

Lesson plans for

JSS Mathematics

JSS 2

TERM 3

NOT FOR SALE

WINNING TEAMS: Mathematics

JSS2 Topic Concept Charts (to support JSS3 pupils) TERM 3

JSS3 Term 3	JSS2 resources for JSS3
Lessons 106 – 109 (JSS3 PHB) Number lines and inequalities	*Refer to **JSS1** for number lines*
Lessons 110 – 115 (JSS3 PHB) Solving linear inequalities	*Refer to **Topic 12** for linear equations.*
Lessons 116 – 117 (JSS3 PHB) Data collection and frequency tables **Lessons 118 – 120** (JSS3 PHB) Bar graphs Line graphs **Lessons 121 – 123** (JSS3 PHB) Pie charts and choosing a graph **Lessons 124 – 126** (JSS3 PHB) Mean, median, mode and range **Lessons 127 – 130** (JSS3 PHB) Grouped data	**Topic 14: Data tables, pictograms and bar graphs** Term 3, Lessons 136 – 138 (JSS2 PHB) Data tables, pictograms and bar graphs **Topic 15: Line graphs & comparing graphs** Term 3, Lessons 139 – 140 (JSS2 PHB) **Topic 17: Pie charts** Term 3, Lessons 144 – 146 (JSS2 PHB) **Topic 16: Mean, median, mode and range** Term 3, Lessons 141 – 143 (JSS2 PHB) Term 3, Lessons 149 to 150 (JSS2 PHB)
Lessons 131 – 140 (JSS3 PHB) Probability	*Not done in JSS2*
Lessons 141 – 143 (JSS3 PHB) Perimeter and area of triangles and quadrilaterals	**Topic 8: Perimeter & area** Term 2, Lessons 61 – 64 (JSS2 PHB) Perimeter and area of rectangles, squares, parallelograms, trapeziums and triangles
Lessons 144 – 145 (JSS3 PHB) Circumference and area of circles	**Topic 18: Circles & composite shapes** Term 2, Lessons 65 – 67 (JSS2 PHB) Perimeter and area of circles, composite shapes
Lessons 146 – 150 (JSS3 PHB) Volume and surface area of prisms and cylinders	**Topic 19: Volume** Term 2, Lessons 68 – 74 (JSS2 PHB) Volume of solids, cubes, rectangular prisms, triangular prisms, cylinders, composite solids Volume story problems **Topic 20: Surface area** Term 2, Lessons 75 – 80 (JSS2 PHB) Surface area of solids, cubes, rectangular prisms, cylinders, composite solids Surface area story problems

WINNING TEAMS: Mathematics

JSS2 Topic Concept Charts (to support JSS3 pupils) TERM 3

Topic 14: Data tables, pictograms & bar graphs M-08-136 to M-08-138 p59 –67

Check that you:
* can collect data, use tallies; make a pictogram

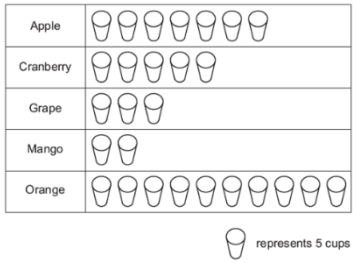
VOCABULARY:
data; tally; tally table; pictogram; frequency; frequency table; bar chart

Refer to Term 3, JSS2 Pupil's Handbook

CONCEPTS:

* **Data** is just information that we can collect and measure. We collect data about chosen topics, numbers or measurements.
* We use **tallies** (marks or strokes) to help us count the number of pieces of data. We group the tallies in fives to make it easier to count them.

A **pictogram** represents data with pictures or symbols.
This pictogram shows the favourite fruit juices of some children. Each cup represents 5 children.



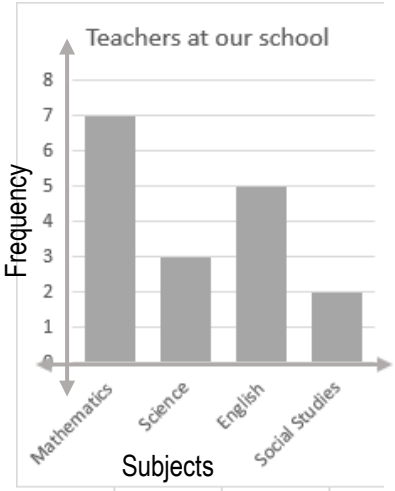
So 7 cups for apple juice represents 35 children.

A **frequency table** is a way to organise and count data.

Number of teachers at our school	Tally	Frequency
Mathematics	//// //	7
Science	///	3
English	////	5
Social Studies	//	2

A **bar chart** must have the following:
* a title
* labels on the x-axis and on the y-axis
* even numbered intervals to show frequency
* equal spaces between the bars of equal width

The height of each bar shows the frequency for that category.



We can see from the graph:
The frequency of Maths teachers is 7.
There are 17 teachers in total.
There are 3 more English teachers than Social Studies teachers.

Topic 14: Data tables, pictograms & bar graphs

Exercise

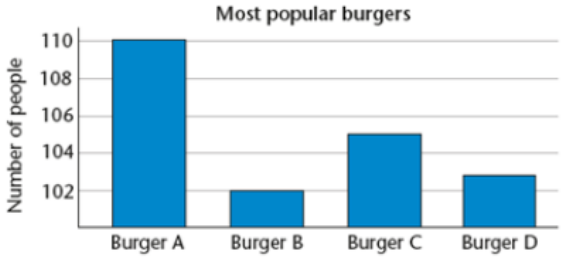
1. The frequency table below shows the number of cans of cooldrink sold at school for 5 days. Complete the missing tally and the frequencies.

Day	Tally	Frequency
1	𝍸 /	6
2		12
3	𝍸 𝍸 𝍸 /	
4	𝍸 𝍸 𝍸 /	
5	𝍸 𝍸 𝍸 ////	

2. The table shows the number of rainy days in Freetown, Sierra Leone every month of 2016. Draw a bar chart to show this. Remember to include labels and axes.

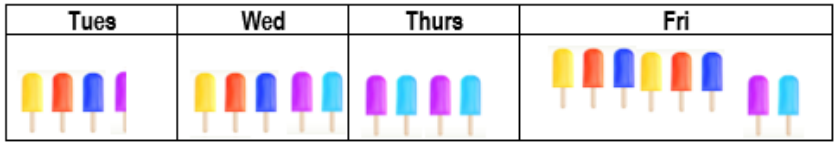
Month	January	February	March	April	May	June	July	August	September	October	November	December
Number of days when it rained	4	3	9	12	21	29	33	33	29	25	28	1

3. Mohamed wanted to know which kind of burger people preferred. This is what he found.



a) Which burger is the most popular?
b) How many people prefer Burger D?
c) How many people did Mohamed get answers from?

4. The pictogram shows how many ice lollies were sold at the school tuckshop on 4 days. Each picture represents 10 ice lollies.

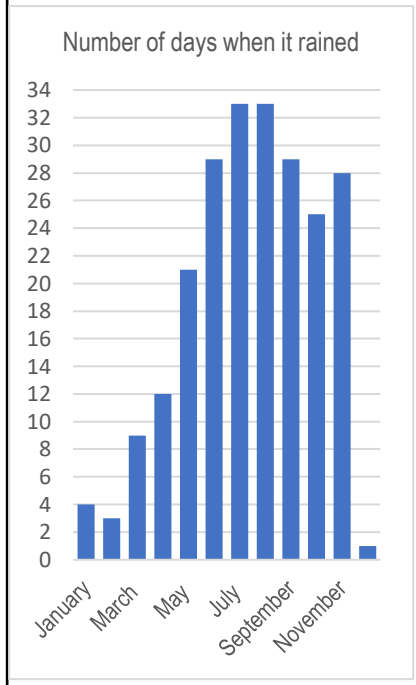


a) How many ice lollies are sold on Tuesday?
b) How many are sold altogether?
c) On which day were the most sold?

Check your answers:

1. Tally for Day 2: 𝍸 𝍸 //
Frequencies: 16, 16 and 19.

2.



3. a) Burger A
b) 103 people
c) 110 + 102 + 105 + 103 = 420

4a) Tues: 35
b) 35 + 50 + 40 + 80 = 205
c) On Friday

WINNING TEAMS: Mathematics

JSS2 Topic Concept Charts (to support JSS3 pupils) TERM 3

Topic 15: Line graphs & comparing graphs M-08-139 to M-08-140 p68 – 73

Check that you can:
* can represent data with tallies, in a table and on a pictogram and a bar graph

VOCABULARY:
frequency; line graph; equal numbered intervals; trend

Refer to JSS2 Pupil's Handbook (PHB)

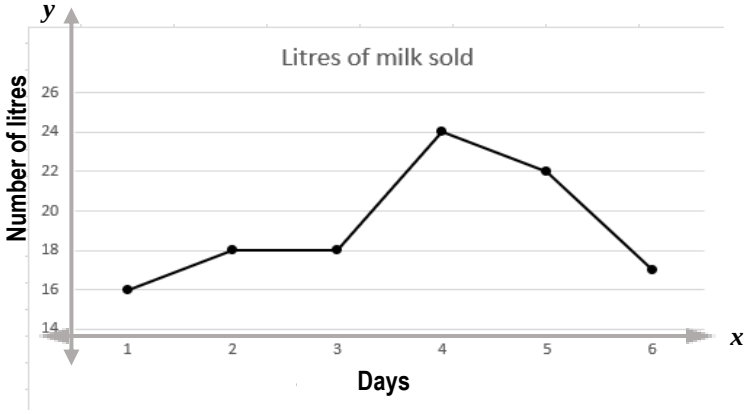
CONCEPTS:

A **line graph** is useful for data that has changed over time.

Example:

The table below shows the litres of milk Mr Mohamed sold in his shop each day for 6 days.

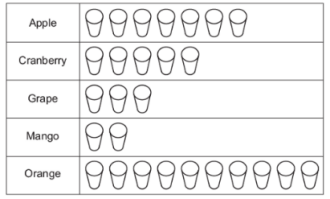
Day	1	2	3	4	5	6
Litres of milk sold in litres	16	18	18	24	22	17

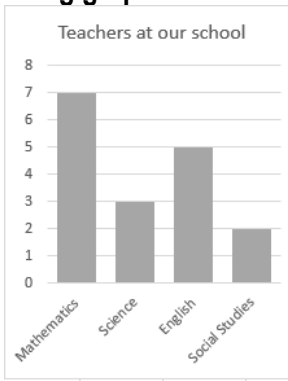


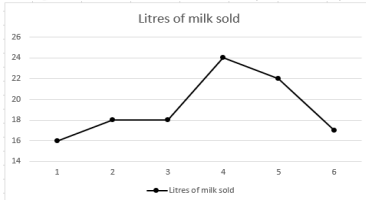
We can display the data on a **line graph.**

* The y-axis needs to go up to more than 24 and can start at a number less than 16.
  Let's use **equal intervals** of 2 from 14 to 26 on y-axis and Days 1 to 6 on x-axis.
  Plot the points and join them to show the change in numbers sold for each day.
* We can use the line graph to see the **trend** in milk sales over 6 days.

Comparing graphs and interpreting graphs





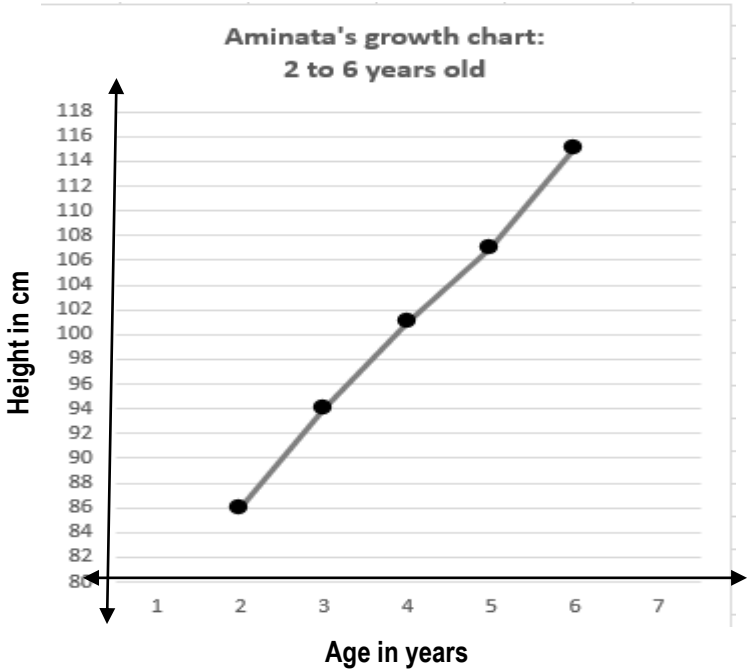


Compare the pictogram, the bar graph and the line graph.
* They make it easy to read and interpret data.
* It is easy to read off the biggest (maximum) and smallest (minimum) value.
* The bar graph and the line graph have equal numbered intervals on the y-axis to show frequency (how many/how much)
* The line graph shows changes and trends over time.

Topic 15: Line graphs and comparing graphs

Exercise

1. Aminata measures her height on her birthday every year and records it on a line graph.



a) What is Aminata's height in cm on her 2nd birthday and on her 6th birthday?
b) How much has Aminata grown between her 2nd birthday and her 6th birthday?
c) In which year was Aminata growth the least?
d) How old was Aminata when her height was 94 cm?
e) Explain why the plotted points are joined to make a line graph.

Choosing a graph

When the data changes over time, use the **line graph.**
When the categories of data are clearly separate (e.g marks for different subjects), the **bar chart** is best
When the relationship to the whole is important, use a **pie chart.**

2. The table shows Jacob's test marks (as a percentage) for Mathematics for Term 2.

Maths test	1	2	3	4	5	6
Percentage	33	45	66	40	72	65

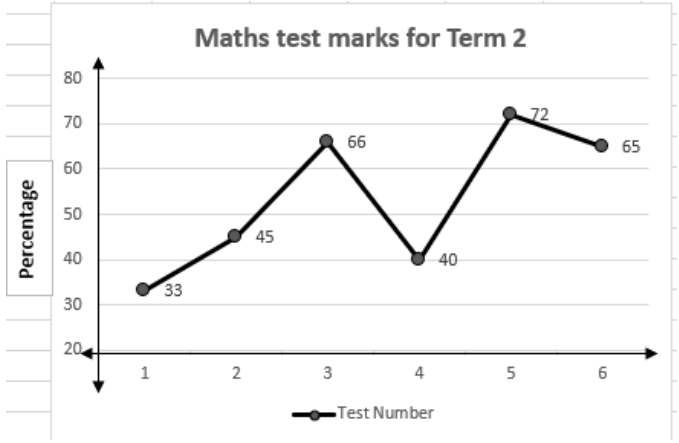
a) Draw a line graph to show Jacob's test marks.
b) Has Jacob improved in Maths during Term 2? Explain by referring to the graph.

Check your answers:

1. a) Aminata's height is 86 cm at 2 years and 115 cm at 6 years.
   b) 115 – 86 = 29 cm
   c) Between her 4th and 5th birthdays, Aminata only grew 6 cm. In the other years, she grew 7 cm or 8 cm.
   d) She was 3 years old.
   e) The points are joined to show that Aminata's growth over time continues between the plotted points.

2. Remember to use equal intervals for frequency on the y-axis, number the tests at equal intervals on the x-axis, and label the graph and the axes.

a)



b) Jacob has improved from 33% to 65% over the term, although his marks dropped in Test 4 and Test 5 was his best mark.

Topic 16: Mean, median, mode and range M-08-141 to M-08-143 p74 – 82

Check that you can:
* work with fractions
* read tables and graphs

VOCABULARY:
Mean, median, mode, range

Refer to JSS2 Pupil's Handbook (PHB)

CONCEPTS:

* The mean, median and mode are called *measures of central tendency* – they locate the approximate middle of the data.

Example 1: We use the ages of 5 women. **25, 36, 60, 43, 25**

* **Mean** = $\frac{\text{sum of all data values}}{\text{number of data values}} = \frac{25+25+36+43+60}{5}$

= 189 ÷ 5 = 37.8 The mean average of the ages is 37.8 years.

* **Median**: the middle value (in the middle place) when the data is ordered.

25; 25; **36;** 43; 60 The median of the ages is 36.

Note: If there are 2 middle values, add them and divide by 2 to find the median

* **Mode**: the value that appears most often.

25; 25; 36; 43; 60 25 is the mode

* The **range** of the data tells you how spread out the data is

* **Range** = highest value – lowest value = 60 – 25 = 35

Example 2:

The marks of 10 college students for a Science test out of 20 are (in order):
6, 9, 11, 12, 14, 15, 16, 16, 19, 20

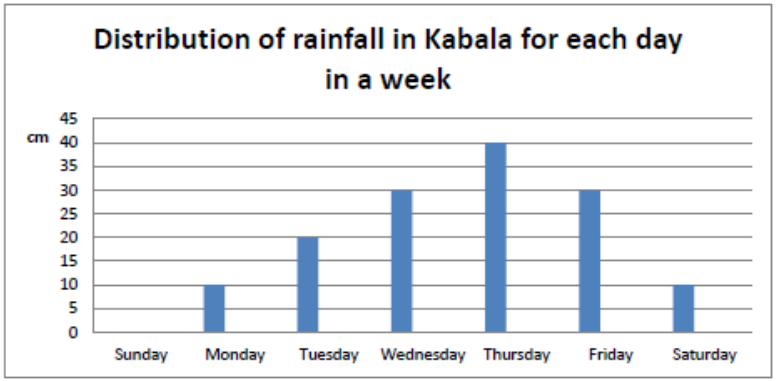
Mean = $\frac{6+9+11+12+14+15+16+16+19+20}{10} = \frac{138}{10}$ = 13,8 marks

Median = $\frac{14 + 15}{2}$ = 14.5 marks

Mode: 16 is the mode for the data.

Range = 20 – 6 = 14 marks

* Example 3



Mean = $\frac{0+10+20+30+40+30+10}{7}$ = 20cm of rain

Median: Middle of ordered data is 20cm

Mode: 10cm and 30cm

Range: 40 – 0 = 40cm

Topic 16: Mean, median, mode and range

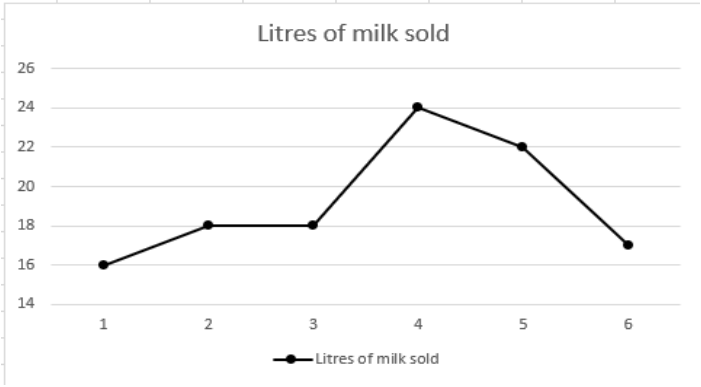
Exercise

1. Find the mean, median, mode and range of the following sets of data:
   a) 93, 47, 47, 47, 10, 83, 14, 44, 27, 91, 44, 84, 72, 60, 47, 84, 23, 15, 38, 87.
   b) 8, 9, 16, 18, 19, 23, 23, 52, 57, 57, 57, 59, 71, 72, 76 (the data is ordered already)
2. Here are the Mathematics test results of a class of 15 learners. The test is out of 30.
   15, 7, 11, 7, 13, 4, 8, 25, 17, 21, 7, 23.
   Calculate the mean, median, mode and range of these test marks.
3. The table shows the number of rainy days in Freetown, Sierra Leone every month of 2016.

Month	January	February	March	April	May	June	July	August	September	October	November	December
Number of days when it rained	4	3	9	12	21	29	33	33	29	25	28	1

   a. Find the mean number of days of rainfall in a month over 2016.
   b. Find the median number of days of rainfall in a month over 2016.
   c. What is the mode of this data?
   d. What is the range of this data?

4. The line graph below shows the number of litres of milk sold for 6 days.



Find the mean, median, mode and range of the graph.

Check your answers:

1. a) sum of numbers:
93+47+47+47+10+83+14+44+27+91+44+84+72+
60+47+84+23+15+38+87 = 1021
Mean = 1021 ÷ 20 = 51.05
Median: First order the data:
10, 14, 15, 23, 27, 38, 44, 44, 47, **47**, **47**, 47, 60, 72, 83, 84, 84, 87, 91, 93.
Median is 47. Mode is 47.
Range is 93 – 10 = 83.
b) Sum = 8+9+16+18+19+23+23+52+57+57+57
+59+71+72+76 = 617
Mean = 617 ÷ 15 = 41.13
Median is 52. The mode is 57.
2. Sum =15+7+11+7+13+4+8+25+17+21+7+23
= 158
Mean = 158 ÷ 12 = 13.17
Median: 4, 7, 7, 7, 8, **11, 13,** 15, 17, 21, 23, 25.
$\frac{11+13}{2} = 12$
Mode: 7 Range: 25 – 4 = 21.
3. Sum = 4 + 3 + 9 + 12 + 21 + 29 + 33 + 33 + 29 + 25 + 28 + 1 = 227
Mean = 227 ÷ 12 = 18.9
Median is $\frac{21+25}{2} = 23$
The two modes are 29 and 33.
Range is 33 – 1 = 32.
4. Sum = 16 + 18 + 18 + 24 + 22 + 17 = 115
Mean: 19.2 Median: 18 Mode: 18
Range: 24 – 16 = 8

WINNING TEAMS: Mathematics

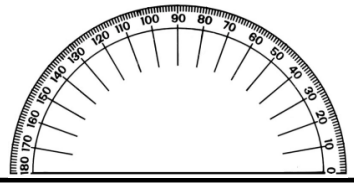
JSS2 Topic Concept Charts (to support JSS3 pupils) TERM 3

Topic 17: Pie charts M-08-144 to M-08-146 p83 – 94

Check that you can:
* calculate with fractions, decimals and percentages

VOCABULARY:
Pie chart; sector; percentage

Refer to JSS2 Pupil's Handbook (PHB)



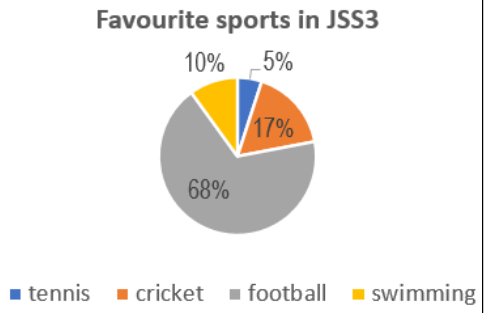
CONCEPTS:

A **pie chart** is a circle with sectors (slices) that represent the data.
Each sector is a fraction of the whole. It is also called a **circle chart**.
The percentages in a pie chart always add up to 100%.
Remember that 100% is the same as one whole.

Example:

* This pie chart shows the favourite sports for 200 JSS3 pupils.
Each pupil chose from four sports: tennis, cricket, football and swimming.
* The percentages add up to 100%, which is represented by the whole pie chart.
* 10% of pupils prefer swimming.
$\frac{10}{100} \times 200 = 20$ pupils
* 68% of pupils prefer football
$\frac{68}{100} \times 200 = 136$ pupils.

* From the pie chart, we see That the twice as many pupils prefer swimming compared to those who prefer tennis.



Drawing a pie chart

Fatmata earns Le 300,000 per month. The table shows her expenses.

Food	Rent	Transport	Medicine	Data	Save
84,000	150,000	36,000	6,000	9,000	

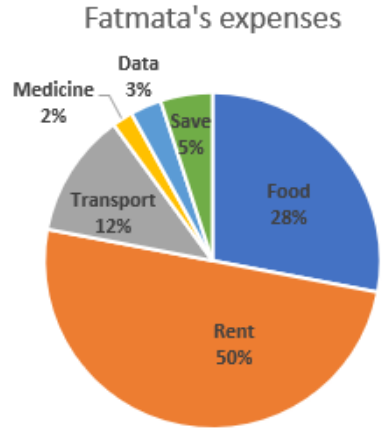
84,000 + 150,000 + 36,000 + 6,000 + 9,000 = 281,000. She has Le 15,000 left to save.

Work out percentages (the first two are done here)

$\frac{84,000}{300,000} \times 100 = 28\%$ $\frac{150,000}{300,000} \times 100 = 50\%$

Work out angles of pie chart (the first two are done here):

$\frac{28}{100} \times 360 = 100{,}8° \approx 101°$ $\frac{50}{100} \times 360 = 180°$

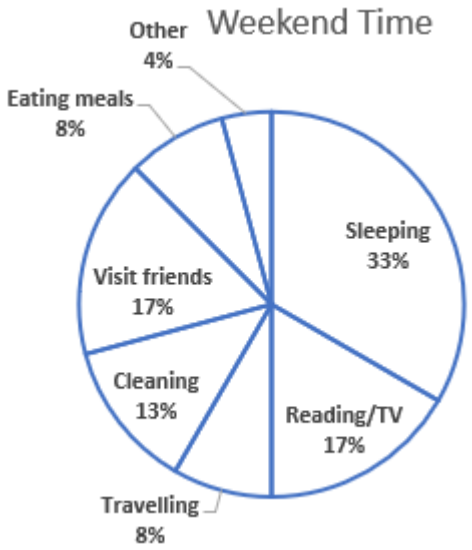


Draw the pie chart:
* Draw a circle. Draw one radius line from the centre to the circumference using a ruler.
* The biggest angle is 180°, so that creates a semi-circle.
* Line up the bottom of a protractor with the centre and the drawn line to measure the next angle, 101°.
* Continue for the other angles. The last sector should be 7°.
* Label each sector of the pie chart.

Topic 17: Pie charts

Exercise

1. Momo made this pie chart to show how he spent a 24-hour day on the weekend.
   a) What does Momo spend the most time on?
   b) What percentage of his time is spent eating meals?
   c) How many hours does Momo spend cleaning the house? Round off your answer to the nearest hour.
   d) On what two activities does he spend the same amount of time



2. Joy owns a fruit stall. She wants to show what fruit she has sold using a pie chart.
   The table below shows the percentage of each fruit sold.

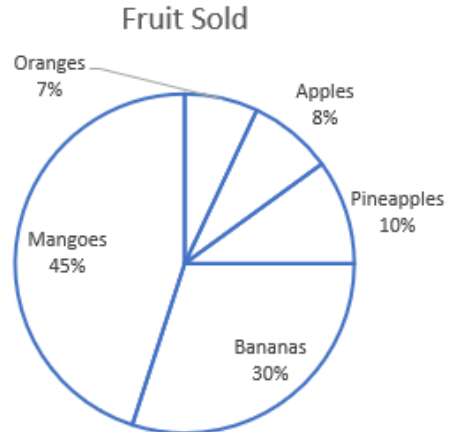
Oranges	7%
Apples	8%
Pineapples	10%
Bananas	30%
Mangoes	45%

   Draw the pie chart.

Check your answers:

1. a) Sleeping b) 8%
   c) 13% of 24 hours = $\frac{13}{100} \times 24 = 3$
   d) Visiting friends and reading or watching TV.

2. Start with the biggest percentage.
Mangoes: 45% × 360° = 162°
Bananas: 30% × 360° = 108°
Pineapples: 10% × 360° = 36°
Apples: 8% × 360° = 29°
Oranges: 7% × 360° = 25°
Measure the angles using a protractor to make the pie chart.



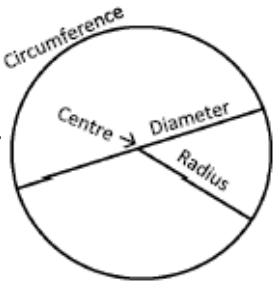
Topic 18: Circles & composite shapes M-08-065 to M-08-067 p26 – 34

Check that you can:
* round off decimal numbers
* identify radius, diameter and circumference of a circle

VOCABULARY:
centre of circle, circumference, radius (plural is radii), diameter; pi (π); approximate value of pi

Refer to JSS2 Pupil's Handbook (PHB), Term 2

CONCEPTS:



* The **radius** is half of the diameter.
* The **diameter** is twice the radius.
* **Circumference** is the distance around the circle.
  C = 2 πr
* **Area** of a circle = $\boldsymbol{\pi r^2}$ (square units)
  where $\pi \approx \frac{22}{7} \approx 3.14$ and *r* is radius.

Example 1:
Calculate the circumference and the area of a circle that has a diameter of 140mm. Use $\pi = 3.14$.

radius is 70 mm = 7 cm.

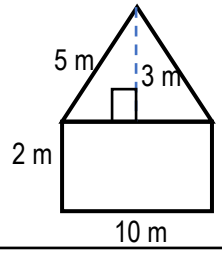
C = $2\pi r = 2 \times 3.14 \times 7 = 43.96 \approx 44$ cm.

A = $\pi r^2 = 3.14 \times 7^2 = 153.86 \approx 154$ cm^2.

Composite shapes

To find the perimeter and area of composite shapes, use a combination of the formulae for basic shapes.

Example 2:

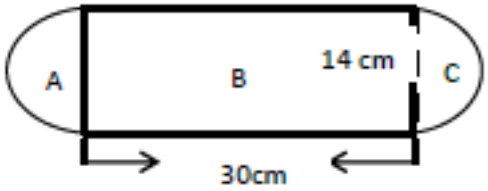


P = 10 + 2 + 5 + 5 + 2 = 24 m

A = Area of rectangle + area of triangle

A = $(2 \times 10) + \frac{1}{2}(10 \times 3) = 20 + 15 = 35$ m^2

Example 3:
Find the perimeter and the area of this shape using the rectangle and the semi-circles.



The short sides of the rectangle are also the diameter for shape A and shape C.

Perimeter = circumference of (A and C) + 30 cm + 30 cm

= $2\pi r$ + 60 cm (radius is 7 cm)

= $2 \times 3.14 \times 7 + 60 = 43.96 + 60 = 103.96$ cm.

Area = Area (A + C) + Area B

= $\frac{1}{2} \pi r^2 + \frac{1}{2} \pi r^2$ + (length × breadth of A)

= $1 \times 3.14 \times 7^2 + (30 \times 14)$

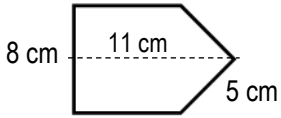
= 573,86 cm^2

Topic 18: Circles & composite shapes

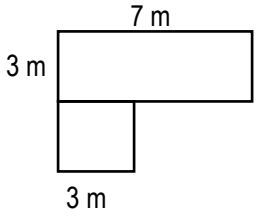
Exercise

Note: Use $\pi = \frac{22}{7}$ *or* π *=3.14 and round off to 2 decimal places*

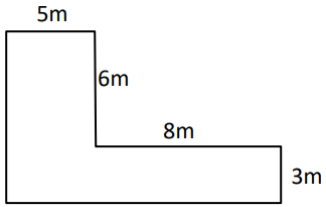
1. Calculate the circumference of a circle that has a diameter of 36 m.
2. Calculate the area of a circle that has a diameter of 36 m.
3. Calculate a) the area and b) the circumference of a circle that has a diameter of 16 mm.
4. If the area of a circle is 452,16 cm^2, calculate (correct to 2 decimal places)
   a) the length of the radius b) the diameter c) the circumference
5. Calculate the perimeter and the area of this composite shape, made from a square of sides 8 cm, equal sides of the triangle are 5 cm and the length of the whole shape is 11 cm.



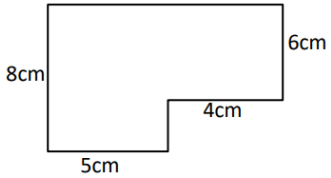
6. The composite shape is made from a square and a rectangle. Calculate the perimeter and the area of the shape.



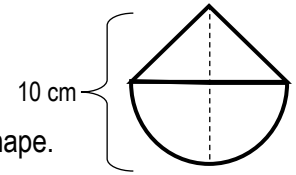
7. Calculate the perimeter and the area of each shape below.
   a)



   b)



8. In this compound shape, the semi-circle has a diameter of 14 cm. The height of the whole shape is 10 cm.
   a) Calculate the area of the compound shape.
   b) Explain why you cannot calculate the perimeter of the whole shape.



Check your answers:

1. D = 36 m, so radius = 18 m
   C = 2πr = $2 \times 3.14 \times 18 = 113.04$ m
2. Area of circle = $\pi r^2 = 3.14 \times (18)^2 = 1017.36$ m^2
3a. Area of circle = $\pi r^2 = 3.14 \times 8^2 = 200.96$ mm^2
   b. C = 2πr = $2 \times 3.14 \times 8 = 50.24$ mm
4a. Area of circle = 452.16 cm^2 = πr^2
   $r^2 = \frac{452.16}{3.14} = 144$
   r = 12 cm and diameter = 24 cm
   C = 2πr = $2 \times 3.14 \times 12 = 75.36$ cm
5. P = 8 + 8 + 8 + 5 + 5 = 34 cm
   Height of triangle = 11 – 8 = 3 cm
   Area = area of square + area of triangle
   = (8×8) cm^2 + $(\frac{1}{2} \times 8 \times 3)$ = 76 cm^2
6. Perimeter = 3 + 7 + 3 + 4 + 3 + 3 + 3 = 26 m.
   Area = area of square + area of rectangle
   = (3×3) + (3×7) = 30 m^2
7. a) Area = area of rectangle + area of rectangle
   = (5×6) + (3×13) = 69 m^2
   b) Area = area of rectangle + area of rectangle
   = (9×6) + (5×2) = 64 cm^2
8. a) Radius is 7 cm. Height of triangle is 10 – 7 = 3 cm.
   Area = area of semi-circle and area of triangle
   = $\frac{1}{2}\pi r^2 + \frac{1}{2}(b \times h) = \frac{1}{2} \times 3.14 \times (7)^2 + \frac{1}{2}(7 \times 3)$
   = 76.93 + 10.5 = 87.43 cm^2
   b) We do not know the length of the sides of the triangle.

Topic 19: Volume M-08-068 to M-08-074 p35 – 51

Check that you know:
- How to find area of a square and a rectangle
- That solids have three dimensions

VOCABULARY:
prism; cross-section; units cubed (cubic units); cube; cuboid; rectangular prism; face (of a prism); base (of a prism)

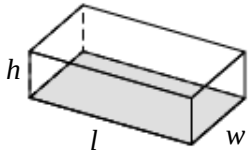
Refer to JSS1 Pupil's Handbook (PHB) pages 92 – 97 and the Lesson Plan Manual.

CONCEPTS:

* The volume of a solid is a measure of the amount of space it takes up.

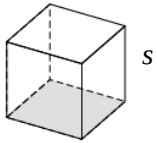
Volume = Area of one base face × height

Volume of a **rectangular prism**
= length (l) × width (w) × height (h)

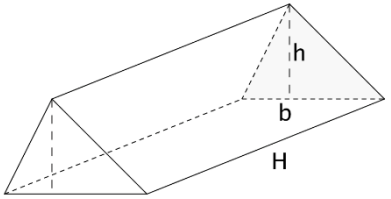


Volume of a **cube** = area of square × height = $s^2 \times s = s^3$

Rectangular prism has a rectangle as base

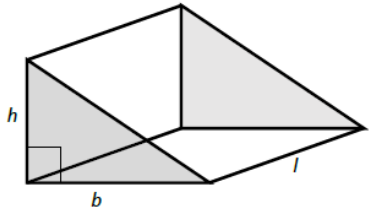


Volume of a triangular prism



Volume = area of triangle × height

$= \frac{1}{2} \times b \times h \times H = \frac{1}{2}bhH$



Volume = area of triangle × height

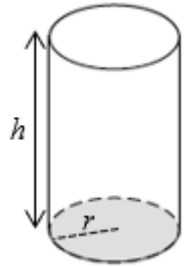
$= \frac{1}{2} \times b \times h \times l = \frac{1}{2}bhl$

The same formula applies to any triangular prism. Make sure you use the perpendicular height h.

Volume of a cylinder

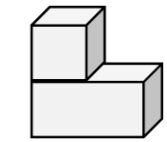
Volume = area of circle × height

$= \pi r^2 h$

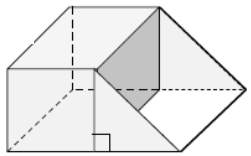


Example of a volume problem:
A rectangular water tank is 5 m high and 3 m long. The depth of the water inside is 75 cm. What is the volume of the water inside the tank?
Use 75 cm = 0.75 m V = 5 × 3 × 0.75 = 11.25 m^3

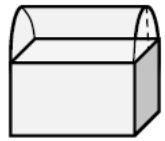
Volume of composite solids is the sum of the volumes of each part of the composite.



V = V_{cube} + $V_{rectangular\ prism}$



V = $V_{rectangular\ prism}$ + $V_{triangular\ prism}$



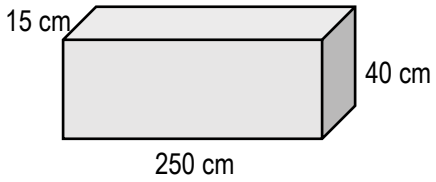
V = $V_{rectangular\ prism}$ + $V_{half\ cylinder}$

Topic 19: Volume

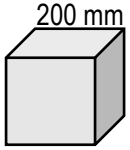
Exercise

1. A rectangular prism is 12 cm long, 6 cm wide and 10 cm high. Calculate the volume.

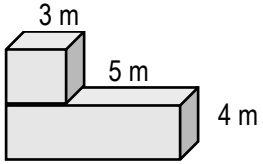
2. Find the volume of the rectangular solid shown here.
Give your answer in cm^3



3. Find the volume of the cube in cm^3



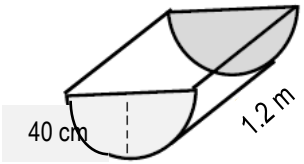
4. I have two boxes, a cube and a rectangular prism. I stick them together as shown alongside. Calculate the total volume of the boxes.



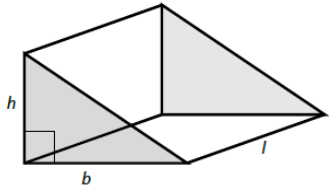
5. A school swimming pool is shaped as a rectangular prism. It is 25 m long, 10 m wide and 3 m deep. Find the volume of water (in m^3) in the swimming pool if it is only half full.

6. A cylindrical water tank has a height of 8 m and a diameter of 6 m. Calculate the volume of the tank in cubic metres.

7. A farmer puts his horses' feed in a half cylinder drum as shown here. It is 1.2 m long and has a radius of 40 cm. What is the volume of the drum in square centimetres.



8. Find the volume of the triangular prism, given that it has a length of 13 cm, the base of the triangle is 6 cm and the perpendicular height of the triangle is 8 cm.



Check your answers:

1. Volume = $12 \times 10 \times 6 = 720$ cm^3
2. Volume = $250 \times 15 \times 40 = 150{,}000$ cm^3
3. 200 mm = 20 cm
   Volume = $(20)^3$ cm^3 = 8000 cm^3
4. Length of prism is 5 + 3 = 8.
   Volume = V of cube + V of prism
   = $(3)^3 + (4 \times 3 \times 8)$
   = 27 + 96 = 123 m^3
5. Volume = $25 \times 3 \times 10 = 750$ m^3
   Half of 750 is 375 m^3
6. Volume = $\pi r^2 h$ and radius is 3 m.
   $= 3.14 \times 3^2 \times 8 = 226.08$
7. 1.2 m = 120 cm
   Volume of half drum
   = $\frac{1}{2} \pi r^2 h$ = $\frac{1}{2}$ $(3.14 \times 40^2 \times 120)$
   = 301,440 cm^3
8. Volume = area of triangle $\times$ height
   $= \frac{1}{2} \times 6 \times 8 \times 13 = 312$ cm^3

Topic 20: Surface area M-08-075 to M-07-080 p52 – 68

Check that you can:
- draw a net from a prism
- find the area of squares, rectangles, circles & triangles.

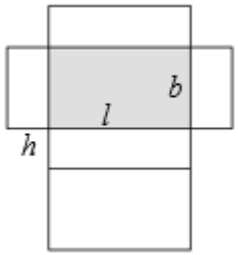
VOCABULARY:
Surface area; prism; units squared (square units); rectangular prism; face (of a prism); base (of a prism)

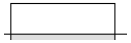
Refer to JSS2 Pupil's Handbook (PHB) , Term 2

CONCEPTS:

* The **surface area** is the area of the outside layer of a solid.
For example, if you painted the outside of a block, the area you need to paint is the surface area. Surface area is measured in **square units** e.g. square metres (m^2).
A net is like a paper version of a solid that can be opened up and laid flat.
We can use the net of an object to find the surface area.

Surface area (SA) of a rectangular prism



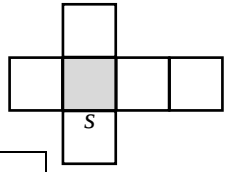
SA = 2 ×  + 2 ×  + 2 × 

$= (2 \times l \times b) + (2 \times b \times h) + (2 \times l \times h)$

$= 2lb + 2bh + 2lh$

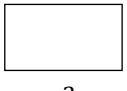
Surface area (SA) of a cube

SA = area of 6 squares = $6 \times s^2$



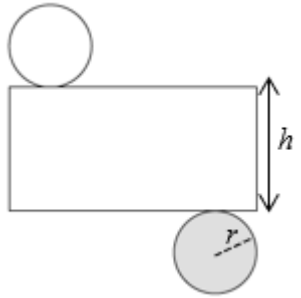
Solid	Surface area
Cube	$6 \times s^2$
Rectangular prism	$2lb + 2bh + 2lh$
Cylinder	$2\pi r^2 + 2\pi rh$
Triangular prism	$bh + (s_1 + s_2 + b) \times l$

Surface area of a cylinder

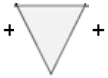
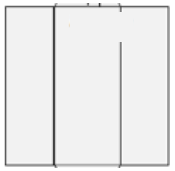
= 2  +  

$= 2\pi r^2 + 2\pi rh$ ($2\pi r$)

Note: The length of the rectangle is the same as the circumference of the circle



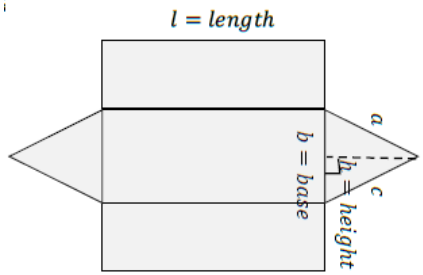
Surface area of a triangular prism

SA =  +  + 

SA = $2 \times (\frac{1}{2}bh) + (\text{perimeter of triangle}) \times l$

$= bh + (s_1 + s_2 + b) \times l$

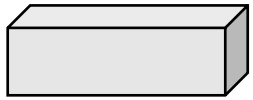
Note: The length of the rectangle is the same as the perimeter of the triangle.



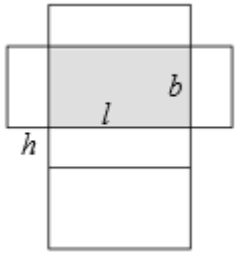
Topic 20: Surface area

Exercise

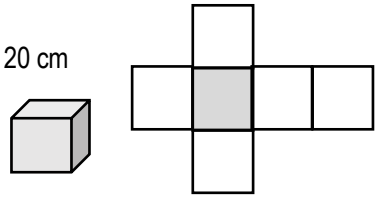
1. a) A rectangular prism is 12 cm long, 6 cm wide and 10 cm high. Calculate the surface area.



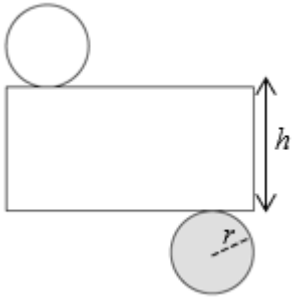
b) Find the surface area of the rectangular prism with length 40 cm, breadth 15 cm and height 15 cm. Give your answer in cm^2



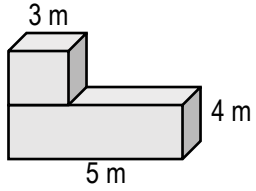
2. Find the surface area of a cube with sides 20 cm



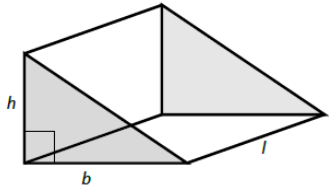
3. A cylindrical water tank has a height of 8 m and a diameter of 6 m. Calculate the surface area of the tank in cubic metres.



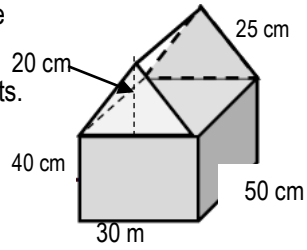
4. I have two boxes, a cube and a rectangular prism. I stick them together as shown alongside. Calculate the surface area of the combined boxes (only the surfaces that are showing).



5. Find the surface area of the triangular prism, given that it has a length of 13 cm, the base of the triangle is 6 cm, the perpendicular height of the triangle is 8 cm and the slope of the triangle is 10 cm.



6. Binta paints her doll house on all outside walls and the outside of the roof. Calculate the surface area that she paints.



Check your answers:

1a) Surface area = $2lb + 2bh + 2lh$
= 2(12)(6) + 2(6)(10) + 2(10)(12)
= 144 + 120 + 240 = 504 cm^2

b) Surface area = $2lb + 2bh + 2lh$
= 2(40)(15) + 2(40)(15) + 2(15)(15)
= 1200 + 1200 + 450 = 2850 cm^2

2. Surface area = $6 \times s^2$ = 6 (20)^2
= 2400 cm^2

3. Surface area = $2\pi r^2 + 2\pi rh$
= 2(3.14)(3)^2 + 2(3.14)(3)(8)
= 207.24 cm^2

4. Surface area = 5 surfaces of cube + 5 surfaces of prism + part of top surface of prism (5 × 4).
Length of prism = 5 + 3 = 8 m.
Surface area = 5 (3)^2 + 2(4 × 3) + 2(8 × 4) + (8 × 3) + (5 × 3)
= 45 + 24 + 64 + 24 + 15 = 172 cm^2

5. Surface area = (13)(10) + (13)(8) + (13)(6) + 2(½)(6)(8) = 360 cm^2

6. Surface area = 2 long walls + 2 shorter walls + 2 rectangles on the roof + 2 triangles on the roof
= 2(40)(50) + 2(40)(30)
+ 2(25)(50) + 2(½ × 30 × 20)
= 4000 + 2400 + 2500 + 600 = 9500 cm^2