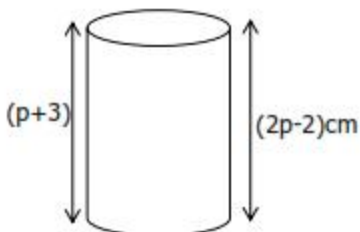


Example 3

Study the diagram below and answer questions that follow.



- a) If the base area of the cylinder is 154cm^2 . Find the radius of the cylinder.

$$\begin{aligned} \pi r^2 &= \text{Area} & \frac{22}{7} \times r^2 &= 154 & \frac{22r^2}{22} &= \frac{154 \times 7}{22} \\ \frac{22}{7} \times r^2 &= 154 & \sqrt{r^2} &= \sqrt{7 \times 7} & r &= 7\text{cm} \\ 7 \times \frac{22r^2}{7} &= 154 \times 7 \end{aligned}$$

- b) Calculate the volume of the cylinder.

Find the height

$$\begin{aligned} 2p - 2 &= p + 3 \\ 2p - p - 2 &= p - p + 3 \\ p - 2 &= 3 \\ p - 2 + 2 &= 3 + 2 \\ p &= 5\text{cm} \end{aligned}$$

$$h = (p+3) = (5+3)\text{cm}$$

$$h = 8\text{cm}$$

$$\text{Volume} = \text{Base area} \times \text{height}$$

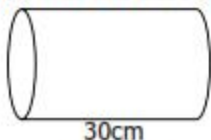
$$\text{Volume} = 154\text{cm}^2 \times 8\text{cm}$$

$$\text{Volume} = (154 \times 8)\text{cm}^3$$

$$\text{Volume} = 1232\text{cm}^3$$

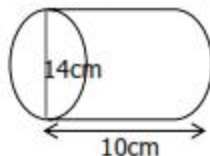
Activity

- The base area of a cylinder is 38.5cm^2 with a height of 10cm .
 - Find the radius of the cylinder.
 - Calculate its volume.
- Given that the base area of a cylinder below is 1386cm^2 .



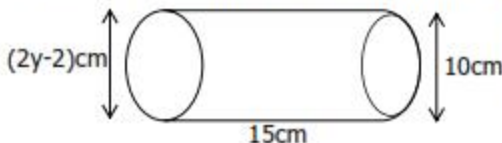
- Workout the radius of the cylinder.
- Calculate the volume of the cylinder.

- Calculate the volume of the cylinder below.



- Work out the base area of the figure.
- Calculate the volume of the cylinder.

- Study the cylinder below and answer questions that follow.



- Find the value of y .
- Calculate the base area of the cylinder.
- Work out the volume of the cylinder.

Activity

- The volume and base area of a cylindrical tank is in the ratio of 5:2 respectively. If the base area of the tank is 154cm^2 .
a) Find the radius of the cylindrical tank. b) Calculate the volume of the tank.
- The base area and volume of a cylindrical tank is in the ratio of 2:5 respectively. If the area is 88cm^2 . Calculate the volume of the cylinder.
- The base area and volume of a cuboid is in the ratio of 1:3 respectively. Find the volume of the cuboid if the base area is 38.5cm^2 .
- The base area and volume of a rectangular tank is in the ratio of 3:5 respectively. If the volume of the tank is 1500cm^3 . Calculate the base area of the tank.
- Given that the area of a cuboid is 144cm^2 and the volume is 480cm^3 . Find the ratio of the area and volume of the cuboid.
- The base area and volume of a cylinder is in the ratio of 5:8 respectively. If the base area of the cylinder is 1500cm^2 . Find the volume of the cylinder.

9.59. Application of Ratios on Radius and Height of Cylinders

Example 1

The ratio of the radius and height of a cylinder are in the ratio of 3:10 respectively.

- a) Given that the radius is 21cm ,
Find the height of the cylinder.

Radius	Height
3	10
21cm	?

3parts represent 21cm

1part represent $\left(\frac{21}{3}\right)\text{cm}$

1part represent 7cm

10parts represent $(7 \times 10)\text{cm}$

10parts represent 70cm

The height is 70cm .

- b) Calculate the area of the volume of the cylinder

$$\text{Volume} = \pi r^2 h$$

$$\text{Volume} = \frac{22}{7} \times 21\text{cm} \times 21\text{cm} \times 70\text{cm}$$

$$\text{Volume} = \frac{22}{7} \times 21^3 \times 21 \times 70\text{cm}^3$$

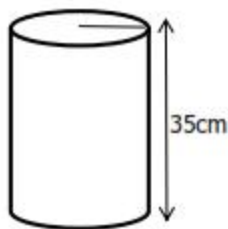
$$\text{Volume} = (22 \times 3 \times 21 \times 70)\text{cm}^3$$

$$\text{Volume} = (66 \times 1470)\text{cm}^3$$

$$\text{Volume} = 97020\text{cm}^3$$

Example 2

The ratio of the height and the radius of a cylindrical tank is 5:2 respectively. If the height is 35cm . calculate the capacity of the tank.



Height	Radius
5	2
35cm	?

5parts represent 35cm

1part represent $\left(\frac{35}{5}\right)\text{cm}$

1part represents 7cm

2parts represent $(7 \times 2)\text{cm}$

2parts represent 14cm

Radius = 14cm

Volume of the cylinder

$$\text{Volume} = \pi r^2 h$$

$$\text{Volume} = \frac{22}{7} \times 14\text{cm} \times 14\text{cm} \times 35\text{cm}$$

$$\text{Volume} = \frac{22}{7} \times 14^2 \times 14 \times 35\text{cm}^3$$

$$\text{Volume} = (22 \times 2 \times 14 \times 35)\text{cm}^3$$

$$\text{Volume} = (44 \times 490)\text{cm}^3$$

$$\text{Volume} = 21560\text{cm}^3$$

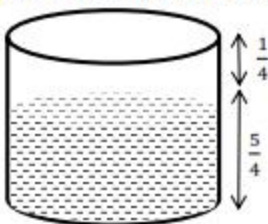
$$1000\text{cm}^3 = 1\text{litre}$$

$$21560\text{cm}^3 = \left(\frac{21560}{1000}\right)\text{litres}$$

$$= 21.56\text{litres}$$

Example 3

The tank below contain water of $\frac{3}{4}$ full. If 210litres were added, it became $\frac{9}{10}$ full. What fraction of water was added?



$$\begin{aligned}\frac{9}{10} - \frac{3}{4} \cdot LCD = 20 \\ \frac{9}{10} \times 20^2 - \frac{3}{4} \times 20^5 \\ \frac{18-15}{20} = \frac{3}{20}\end{aligned}$$

Calculate the capacity of the tank when full.

3parts represent 210litres

1part represents $(\frac{210}{3})$ litres

1part represents 70litres

20parts represent (70×20) litres

20parts represent 1400litres.

Let the capacity = p

$$\frac{3}{20} \times p = 210 \text{ litres}$$

$$20^1 \times \frac{3p}{20_1} = (210 \times 20) \text{ litres}$$

$$\frac{3p^1}{5_1} = \left(\frac{210 \times 20}{a_1} \right) \text{ litres}$$

$$P = 70 \times 20 \text{ litres}$$

$$P = 1400 \text{ litres}$$

Example 4

Tank A $\frac{1}{2}$ full of water and tank B is $\frac{3}{4}$ full of water but they can hold the same amount of water. If there are 24 more litres in tank B than tank A.

- a) Find the volume of water tank B can hold when completely full. Find the difference in the water of the two tanks

$$\begin{aligned}\frac{3}{4} - \frac{1}{2} \cdot LCD = 4 \\ \frac{1 \times 3 - 2 \times 1}{4} = \frac{3-2}{4} \\ = \frac{1}{4}\end{aligned}$$

Volume of water in the tank.

1part represents 24litres

4parts represent (24×4) litres

4parts represent 96litres

The tank can hold 96litres

- b) How much water is in tank B now?

The tank is $\frac{3}{4}$ now

$$\frac{3}{4} \times 96^{24} \text{ litres}$$

$$(3 \times 24) \text{ litres}$$

$$72 \text{ litres}$$

A tank is $\frac{3}{4}$ full of water, when 300 litres of water is removed it becomes $\frac{1}{3}$ full. How many litres of water can the tank hold when completely full?

Fraction of water which was removed

$$\begin{aligned}\frac{3}{4} - \frac{1}{3} \cdot L.C.D = 12 \\ \frac{3 \times 3 - 4 \times 1}{12} = \frac{9-4}{12}\end{aligned}$$

5parts represent 300litres

1part represents $(\frac{300}{5})$ litres

1 part represents 60litres

12parts represent (60×12) litres

12parts represent 720litres

The tank can hold 720litres

11.7. Awarding of Marks or Scores

Example 1

A teacher gave a test of 20 questions and awarded 4 marks for every correct question and deducted a mark for every wrong question. If a pupil got 15 correct questions,

a) What marks did the pupil get?

Marks obtained from correct questions $= (15 \times 4) = 60$ marks He got $(60 - 5)$ marks

Marks obtained from wrong questions $= (20 - 15) \times -1$ He got $(60 - 5)$ marks
 $= (5 \times -1)$ marks
 $= -5$ marks

b) If the pupil got 60 marks, how many questions did he get correct?

Let the correct questions = n

Wrong questions = $(20 - n)$

Marks from correct questions	Marks from wrong questions	Total marks
$(n \times 4)$	$-1(20 - n)$	60

$$n \times 4 + -1(20 - n) = 60$$

$$4n - 20 + n = 60$$

$$4n + n - 20 = 60$$

$$5n - 20 + 20 = 60 + 20$$

$$\frac{5n}{5} = \frac{80}{5}$$

$$n = 16$$

He got 16 questions correct.

c) How many questions did he fail?

He failed $(20 - 16) = 4$ questions

Example 2

A teacher gave a test of 20 questions to a girl. He awarded 5 marks for every correct answer but deducted 2 marks for every wrong answer. If a pupil got 72 marks, how many questions did he fail?

Let the correct questions = m .

Correct questions	Wrong questions	Total
$m \times 5$	$-2(20 - m)$	72

$$5m - 40 + 2m = 72$$

$$5m + 2m - 40 = 72$$

$$7m - 40 + 40 = 72 + 40$$

$$\frac{7m}{7} = \frac{112}{7}$$

$$m = 16$$

16 were correct questions

Wrong questions = $(20 - m)$

$= (20 - 16)$ questions

$= 4$ wrong questions

Activity

1. A teacher awards 3 marks for every correct answer and subtracts 2 marks for every wrong answer in a test of 30 questions.

a) If Joanita answered 25 questions correctly, how many marks did she get?

b) If Joseph failed 8 questions, find his final marks.

Example 2

Three men Mukasa, Mukiibi and Mugabi contributed money for a business. In the ratio of 3:5:7 respectively. If Mukasa gave sh.360,000 less than Mugabi. How much did Mukiibi distribute?

Mukasa	Mukiibi	Mugabi	Total ratio
3	5	7	15

$$\frac{7}{15} - \frac{3}{15} = \frac{4}{15}$$

4 parts represent sh.360,000

1 part represents $\frac{360,000}{4}$

1 part represents sh.90,000

Mukiibi contributed 5 parts

if 1 part represents sh.90,000

5 parts represent sh.90,000 x 5

5 parts represent sh.450,000

Mukiibi contributed sh.450,000

Activity

- Water and milk are mixed in the ratio of 3:1 to make tea for a party. How many litres of milk are in 20 litres of tea?
- Okello divided his money among his daughters; Annet, Babra and Christine in the ratio of 4:5:6 respectively. If Annet got sh.600,000, find the amount of money that Okello had at the beginning.
- In a feeds factory, crushed fish is mixed with maize flour in the ratio of 1:3. The feed are packed in 80kg bags.
 - How many kilograms of fish are used in one bag of the feeds?
 - If one kilogram of maize flour costs sh.4000, how much does it cost to buy maize flour to make feeds weighing 1000kg?
- Okot, Odongo and Okello shared a certain sum of money in the ratio of 3:2:4 respectively. If Okello got sh.48,000 more than Odongo,
 - How much money did they share altogether?
 - How much did Okot get?
- A, B and C contributed for a business in the ratio of 5:3:4 respectively. C contributed sh80,000 more than B.
 - How much did they contribute altogether?
 - How much did A contribute?
- Juliet, Grace and Moreen shared a certain amount of money in the ratio 4:3:7 respectively. If Moreen got sh.120,000 more than Juliet,
 - Find their total share.
 - Express the amount got by Moreen as a percentage of the total share.
- Ann, Barbra and Christine shared money in the ratio of 4:5:6 respectively. If Ann got sh.700,000 less than Christine.
 - How much did they share altogether?
 - How much did Christine get?
- Jolly, Julie and Molly shared in the ratio of 3:2:5 respectively. If molly got sh.18,000 more than Jolly.
 - How much did they share altogether?
 - How much more money did Jolly get than Julie?

Activity

- After selling a plot of land to Joseph at shs.9,000,000, Josephine made a loss of 10%. How much money did Josephine pay for the plot of land?
- A man sold a plot of land at sh.72,000,000 and made a loss of 20%. How much did he buy the plot?
- The selling price of a cell phone is sh.120,000 a shop keeper gets a loss of 20%. Calculate the cost price of the phone.
- Linda spent 70% of her salary on food, 50% of the remaining on other things. She was left with sh.60,000. How much did she have at the beginning?
- Majidu sold a dozen of books at sh.30,000 making a loss of 40%. How much did Majidu buy a dozen of books?
- Madowadowa's wage was decreased by 10% to sh.108,000. Find his old salary.
- A Mutembeyi sold a phone at sh.43200 making a loss of 40%. How much did the Mutembeyi buy the phone?
- The price of a shirt was reduced by 30% to sh.28000. How much was the price of the shirt before the reduction?
- A bus fare from Kigali to Kampala was decreased by 20% to sh.40,000. Calculate the previous fare of the bus from Kigali to Kampala.
- Miss Birungi paid sh.15,000 from Kampala to Mbale after a reduction of 25%. Work out the previous fare.

5.39. Application of Percentage In Relation To Fractions
Example 1

Odinga spends 20% of his salary on water bills, 10% of the remainder on yaka bills and save the rest. If Odinga saves sh.504,000.

- a) Calculate the percentage saved.

Water bills	Reminder	Yaka bills	Savings
20%	$\frac{100}{100} - \frac{20}{100} = \frac{80}{100}$	$\frac{80}{100} \times \frac{10}{100} = \frac{8}{100} = 8\%$	$\frac{100}{100} - \left(\frac{20}{100} + \frac{8}{100} \right)$ $\frac{100}{100} - \frac{28}{100} = \frac{72}{100}$

- b) Calculate Odinga's monthly salary.

Method 1

72% represent sh. 504000

1% represent sh. $\left(\frac{504000 \times 100}{72} \right)$

1% represent sh. 7000

100% represent sh. (7000×100)

100% represent sh.700,000

Odinga's salary is sh. 700,000

Method 2

Let his total salary = p

$\frac{72}{100}$ of p = sh. 504000

$100 \times \frac{72}{100} \times p = sh. 504000 \times 100$

$\frac{72p}{72} = sh. \frac{50400000 \times 100}{72}$

P = sh.700,000

Odong's salary is sh.700,000

2. An Aeroplane flew from Entebbe airport for Newyork at a speed of 120km/hr for 6hours. On its way back due to the bad weather it reduced the speed by 80km/hr.
 - a) Find the distance from Entebbe to Newyork.
 - b) Calculate the average speed for the whole journey.
3. A motorist covered $33\frac{1}{3}\%$ of the journey in 2hours and he remained with 140km. if the average speed for the whole journey was 45km/h,
 - a) Calculate the time he took to complete the remaining journey.
 - b) Calculate the average speed he used to complete the journey.
4. YY bus broke down after covering 210km from Kampala heading to Moroto, this was 30% of the journey. If it took 8hours to cover the whole journey calculate the average speed for the whole journey.

8.9. More About Average Speed**Example 1**

A Nile coach bus travelled from Kampala to Arua broke down after covering $\frac{3}{4}$ of the journey. Calculate the distance from Kampala to Arua if it was remaining with 60km to complete the journey.

Fraction of the journey remaining.

$$1 - \frac{3}{4} = \frac{4-3}{4} \\ = \frac{1}{4}$$

Distance from Kampala to Arua.

1part represents 60km.

4parts represent (60×4) km.

4parts represent 240km.

Its 240km from Kampala to Arua.

Example 2

A Uganda athlete collapsed after covering $\frac{1}{3}$ of the journey. If he was remaining with 24km. what distance was he supposed to cover?

Remaining fraction to complete the journey

$$1 - \frac{1}{3} = \frac{3-1}{3} \\ = \frac{2}{3}$$

2parts represent 24km.

1part represent $\left(\frac{24}{2}\right)$ km

1part represent 12km.

3parts represent (12×3) km.

3parts represent 36km

Example 3

A train from Mombasa to Kampala left at 5:00am and broke down in Kisumu after covering $\frac{7}{12}$ of the journey. Repairing took one hour and then continued to Kampala covering a distance of 300km from Kisumu.

9.15. Application of Ratios on the Diagonals of a Rhombus

Example

The diagonals of a rhombus are as the ratio of 2:3 respectively. The length of the shorter side is 16cm. calculate the area of the rhombus.

Diagonal 1	Diagonal 2
2	3
16cm	?

2parts represent 16cm

1part represents $\left(\frac{16}{2}\right)$ cm

1part represents 8cm.

∴ 3parts represent (8×3) cm.

3parts represent 24cm

2nd diagonal = 24cm

Area of the rhombus

$$\text{Area} = \frac{1}{2} \times d_1 \times d_2$$

$$\text{Area} = \frac{1}{2} \times 16\text{cm} \times 24\text{cm}$$

$$\text{Area} = \frac{1}{2} \times 18^9 \times 24\text{cm}^2$$

$$\text{Area} = 9 \times 24\text{cm}^2$$

$$\text{Area} = 216\text{cm}^2$$

Example 2

The diagonals of a rhombus are in the ratio of 3:5 respectively. Calculate the area of the rhombus whose longer side is 15cm.

Diagonal 1	Diagonal 2
3	5
?	15cm

5parts represent 15cm

1part represents $\left(\frac{15}{5}\right)$ cm

1part represents 3cm

3parts represents (3×3) cm

3parts represent 9cm

$$d_1 = 9\text{cm } d_2 = 15\text{cm}$$

$$\text{Area} = \frac{1}{2} \times 9\text{cm} \times 15\text{cm}$$

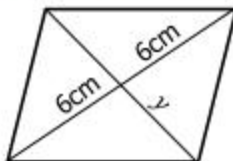
$$A = \frac{1}{2} \times 9 \times 15\text{cm}$$

$$A = \left(\frac{135}{2}\right)\text{cm}^2$$

$$A = 67\frac{1}{2}\text{cm}^2$$

Activity

- The two diagonals of a rhombus are u=in the ratio of 3:8 respectively. The longer diagonal is 24cm.
a) Find the length of the shorter diagonal. b) Calculate the area of the rhombus
- The diagonals of a rhombus are in the ratio of 2:3 respectively. If the larger diagonal is 12cm.
a) Find the length of the smaller diagonal. b) Calculate the area of the rhombus.
- Study the rhombus below carefully and answer the questions that follow. Given the diagonals are in the ratio of 3:4.



a) Find the value of y .

b) Calculate the area of the rhombus.

- The diagonals of a rhombus are in the ratio of 3:4 respectively. The length of the longer diagonal (D1) is 12cm.
a) Find the length of diagonal two. (D2) b) What is the area of the rhombus?

9.17. Application of Ratios on Area and Perimeter of rectangles and Triangles**Example 1**

The length and width of a rectangle are in the ratio of 3:2 respectively. If the area of the rectangle is 150cm^2 .

- a) Find the actual length and width of the rectangle.

Let the constant length = p

Length	Width	Area
$3 \times p$	$2 \times p$	150
$3p$	$2p$	150

$$L \times W = A$$

$$3p \times 2p = 150$$

$$\frac{6p^2}{6} = \frac{150}{6}$$

$$\sqrt{p^2} = \sqrt{25}$$

$$p = 5$$

$$\text{Length } 3p = 3 \times 5\text{cm} = 15\text{cm}$$

$$\text{Width } 2p = 2 \times 5\text{cm} = 10\text{cm}$$

- b) Calculate the perimeter of the rectangle.

$$P = 2(L+W)$$

$$P = 2(15\text{cm} + 10\text{cm})$$

$$P = 2 \times 25\text{cm}$$

$$P = 50\text{cm}$$

Example 2

The ratio of the length and width of a rectangle is 5:3 respectively. The perimeter of the rectangle is 64cm .

- a) Find the actual length and width of the rectangle.

Let the constant length = y .

Length	Width	Perimeter
$5 \times y$	$3 \times y$	64
$5y$	$3y$	64cm

$$\text{Perimeter} = 2(L+W)$$

$$2(L+W) = p$$

$$2(5y + 3y) = 64\text{cm}$$

$$2 \times 8y = 64\text{cm}$$

$$\frac{16y}{16} = \frac{64\text{cm}}{16}$$

$$y = 4\text{cm}$$

$$\text{Length } 5y = (5 \times 4)\text{cm}$$

$$L = 20\text{cm}$$

$$\text{Width } 3y = (3 \times 4)\text{cm}$$

$$W = 12\text{cm}$$

- b) Calculate the area of the rectangle.

$$\text{Area} = \text{Length} \times \text{Width}$$

$$\text{Area} = 20\text{cm} \times 12\text{cm}$$

$$\text{Area} = (20 \times 12)\text{cm}^2$$

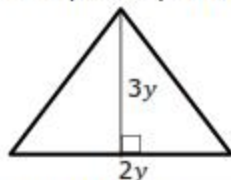
$$\text{Area} = 240\text{cm}^2$$

Example 3

The base and height of a triangle are in the ratio of 2:3 respectively. If the area of triangle is 48cm^2 , find the base and height.

Let their constant length = y .

Base	Height	Area
$2 \times y$	$3 \times y$	48cm^2
$2y$	$3y$	48cm^2



9.24. Application of Ratios on diagonals of kites to find the Area

Example 1

The diagonals of a kite are in the ratio of 3:5 respectively, the length of the shorter diagonal is 18cm.

a) Find the length of the second diagonal.

D ₁	D ₂
3	5
18cm	?

3parts represent 18cm

1part represent $\left(\frac{18}{3}\right)$ cm

1part represent 6cm

5parts represent (6×5)cm

5parts represent 30cm

Diagonal two 30cm

b) Calculate the area of the kite.

$$\text{Area} = \frac{1}{2} \times d^1 \times d^2$$

$$\text{Area} = \frac{1}{2} \times 18\text{cm} \times 30\text{cm}$$

$$\text{Area} = \frac{1}{2} \times 18^9 \times 30\text{cm}^2$$

$$\text{Area} = (9 \times 30)\text{cm}^2$$

$$\text{Area} = 270\text{cm}^2$$

Example 2

The two diagonals of a kite are in the ratio of 4:5 respectively. Given that the shorter diagonal is 8cm.

a) Find the length of the second diagonal.

D ₁	D ₂
4	5
8cm	?

4part represent 8cm

1part represents $\left(\frac{8}{4}\right)$ cm

1part represents 2cm

5parts represent (2×5)cm

5parts represent 10cm

The second diagonal=10cm

b) Calculate the area of the kite.

$$\text{Area} = \frac{1}{2} \times d_1 \times d_2$$

$$\text{Area} = \frac{1}{2} \times 8\text{cm} \times 10\text{cm}$$

$$\text{Area} = (4 \times 10)\text{cm}^2$$

$$\text{Area} = 40\text{cm}^2$$

Activity

- The two diagonals of a kite are in the ratio of 2:3 respectively. The length of the shorter diagonal is 6cm.
 - Find the length of the longer diagonal.
 - Calculate the area of the kite.
- The diagonals of a kite are in the ratio of 5:2 respectively. If the shorter diagonal is 14cm. find the area of the kite.
- The area of a kite is 180cm². One of the diagonals is 20cm. calculate the length of the second diagonal.
- The ratio of the two diagonals of a kite is 3:7 respectively. If the shorter diagonal is 18cm,
 - Find the length of the second diagonal.
 - Calculate the area of the kite.
- The ratio of two diagonals of kite is 5:8 respectively. Calculate the area of kite if the diagonal of the longer side is 16cm.
- Calculate the area of the kite whose two diagonal are in the ratio of 8:3 respectively. Given the longer side is 24cm.