

- a basic number
- 2 exponent

√ radial sign indicating the square root.

√a² square root of 'a' squared

a² radicand

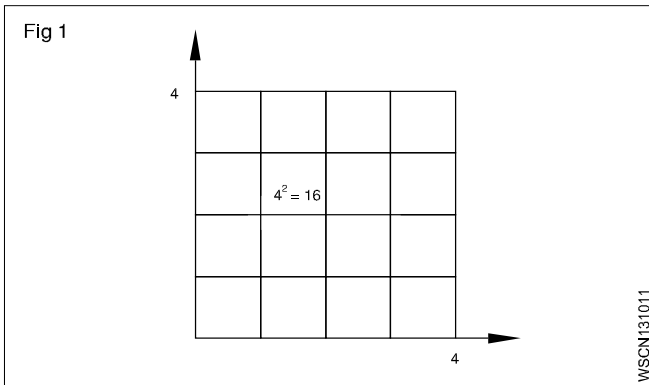
Square number

The square of a number is the number multiplied by itself.

Basic number x basic number = Square number

a x a = a²

4 x 4 = 4² = 16



Splitting up

A square area can be split up into sub-areas. The largest square of 36 is made up of a large square 16, a small square 4 and two rectangles 8 each.

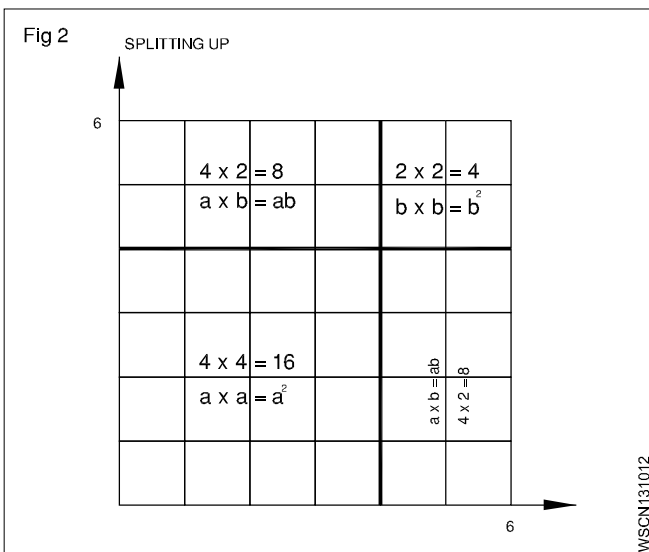
Large square 4 x 4 = 16 a²

Two rectangles 2 x 4 x 2 = 16 2ab

Small square 2 x 2 = 4 b²

Sum of sub-areas = 36 = a² + 2ab + b²

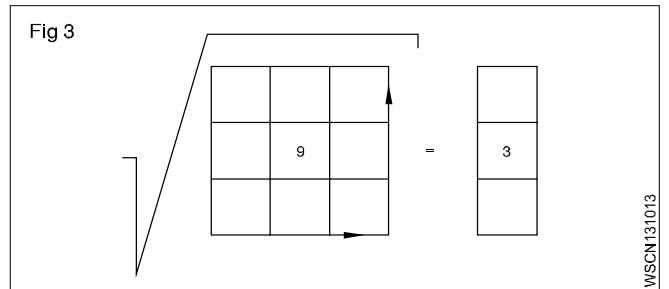
√36 = √a² + 2ab + b²



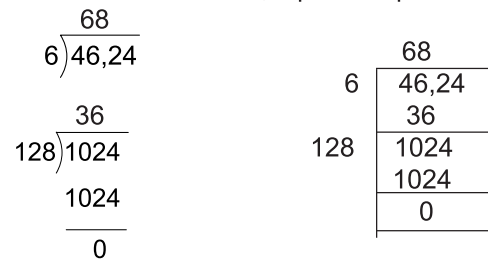
Result: In order to find the square root, we split up the square numbers.

Extracting the square root procedure

- Starting from the decimal point form groups of two figures towards right and left. Indicate by a prime symbol. √46,24.00
- Find the root of the first group, calculate the difference, bring down the next group.
- Multiply the root by 2 and divide the partial radicand.
- Enter the number thus calculated in the divisor for the multiplication.



If there is a remainder, repeat the procedure.

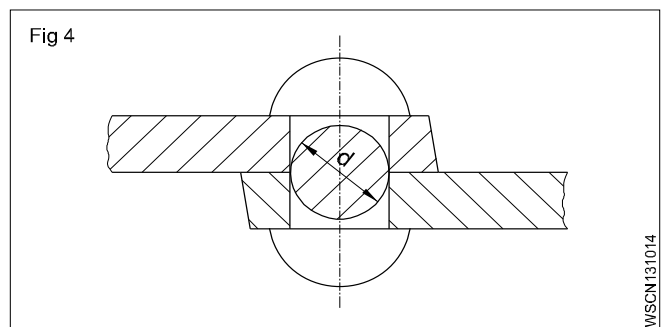


√46,24 = 68

Basic number x basic number = Square
√Square number = basic number

Example

The cross-section of a rivet is 3.46 cm². Calculate the diameter of the hole.



Rivet cross-section is the hole cross-section.

To find d₁,
 Given that Area = 3.46 cm²
 Area = 0.785 x d² (formula)
 3.46 cm² = d² x 0.785

$$d^2 = \frac{3.46 \text{ cm}^2}{0.785}$$

$$d = \sqrt{\frac{3.46}{0.785}} \text{ cm}$$

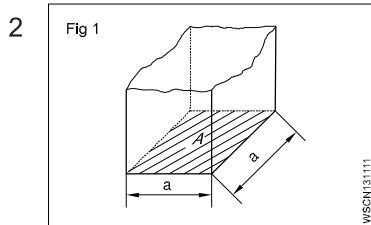
$$d = 2.1 \text{ cm (or) } 21 \text{ mm}$$

1 a $\sqrt{2916} = \underline{\hspace{2cm}}$

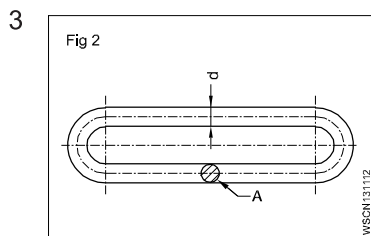
b $\sqrt{45796} = \underline{\hspace{2cm}}$

c $\sqrt{8.2944} = \underline{\hspace{2cm}}$

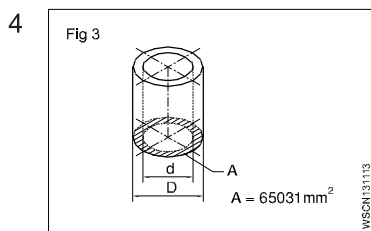
d $\sqrt{63.845} = \underline{\hspace{2cm}}$



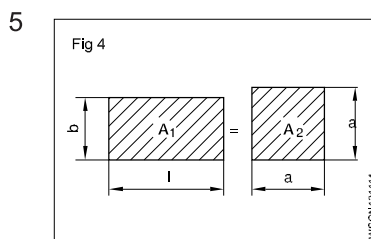
$A = 2025 \text{ mm}^2$
 $a = \underline{\hspace{2cm}} \text{ mm}$



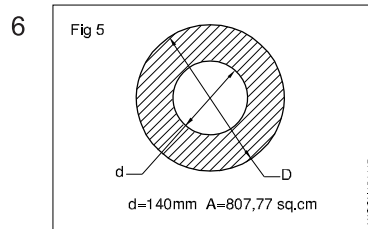
$A = 176.715 \text{ mm}^2$
 $d = \underline{\hspace{2cm}} \text{ mm}$



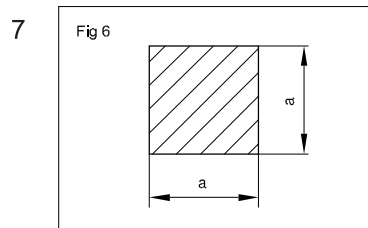
$A = 65031 \text{ mm}^2$
 $d = 140 \text{ mm}$
 $D = \underline{\hspace{2cm}} \text{ mm}$



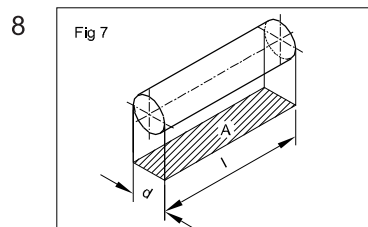
$l = 58 \text{ cm}$
 $b = 45 \text{ cm}$
 $A_1 = A_2$
 $a = \underline{\hspace{2cm}} \text{ cm}$



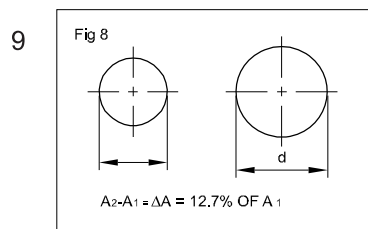
$A = 807.77 \text{ cm}^2$
 $d = 140 \text{ mm}$
 $D = \underline{\hspace{2cm}} \text{ mm}$



$a \times a = 543169 \text{ mm}^2$
 $a = \underline{\hspace{2cm}} \text{ mm}$



$d : l = 1 : 1.5$
 $A = 73.5 \text{ mm}^2$
 $d = \underline{\hspace{2cm}} \text{ mm}$



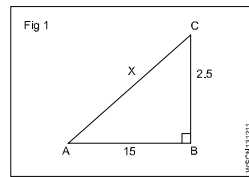
increase in area
 $A = 12.7\%$
 $A = 360 \text{ mm}^2$
 $d = \underline{\hspace{2cm}} \text{ mm}$
 (d = diameter after the increase in area)

Square root - Applications of pythagoras theorem and related problems

Exercise 1.2.10

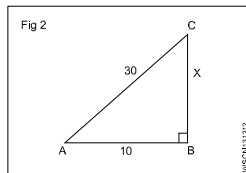
- 1 What is the side AC if AB = 15 cm, BC = 25 cm.

$$\begin{aligned} AC^2 &= AB^2 + BC^2 \\ &= 15^2 + 25^2 \\ &= 225 + 625 = 850 \\ AC &= \sqrt{850} = 29.155 \text{ cm} \end{aligned}$$



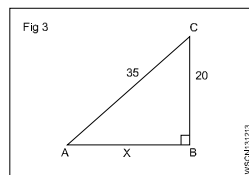
- 2 What is the side BC if AB = 10 cm, AC = 30 cm.

$$\begin{aligned} AC^2 &= AB^2 + BC^2 \\ 30^2 &= 10^2 + BC^2 \\ 900 &= 100 + BC^2 \\ BC^2 &= 900 - 100 = 800 \\ BC &= 28.284 \text{ cm} \end{aligned}$$



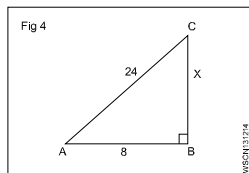
- 3 What is the side AB if BC = 20 cm, AC = 35 cm.

$$\begin{aligned} AC^2 &= AB^2 + BC^2 \\ 35^2 &= AB^2 + 20^2 \\ 1225 &= AB^2 + 400 \\ AB^2 &= 1225 - 400 = 825 \\ AB &= 28.72 \text{ cm} \end{aligned}$$



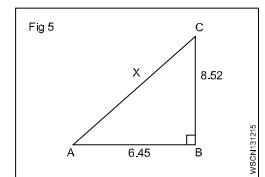
- 4 What is the value of side BC if AB = 8 cm, AC = 24 cm.

$$\begin{aligned} AC^2 &= AB^2 + BC^2 \\ 24^2 &= 8^2 + BC^2 \\ 576 &= 64 + BC^2 \\ BC^2 &= 576 - 64 = 512 \\ BC &= \sqrt{512} = 22.63 \text{ cm} \end{aligned}$$



- 5 What is the value side AC if AB = 6.45 cm, BC = 8.52 cm.

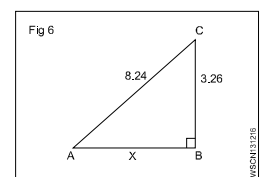
$$\begin{aligned} AC^2 &= AB^2 + BC^2 \\ AC^2 &= 6.45^2 + 8.52^2 \\ AC^2 &= 41.60 + 72.59 \\ &= 114.19 \end{aligned}$$



$$AC = \sqrt{114.19} = 10.69 \text{ cm}$$

- 6 What is the value of side AB if BC = 3.26 cm, AC = 8.24 cm.

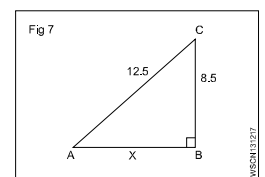
$$\begin{aligned} AC^2 &= AB^2 + BC^2 \\ 8.24^2 &= AB^2 + 3.26^2 \\ 67.9 &= AB^2 + 10.63 \\ AB^2 &= 67.9 - 10.63 \\ &= 57.27 \end{aligned}$$



$$AB = \sqrt{57.27} = 7.57 \text{ cm}$$

- 7 What is the value of side AB if AC = 12.5 cm, BC = 8.5 cm.

$$\begin{aligned} AC^2 &= AB^2 + BC^2 \\ 12.5^2 &= AB^2 + 8.5^2 \\ 156.25 &= AB^2 + 72.25 \\ AB^2 &= 156.25 - 72.25 \\ &= 84 \end{aligned}$$



$$AB = \sqrt{84} = 9.17 \text{ cm}$$

Assignment

- What is the value of side AB, in a right angled triangle of side AC = 12.5 cm and BC = 7.5 cm.
- What is the value of side AC, in a right angled triangle of side AB = 6.5 cm and BC = 4.5 cm.
- What is the value of side BC, in a right angled triangle of side AC = 14.5 cm and AB = 10.5 cm.
- What is the value of side AC, in a right angled triangle of side AB = 7 cm and BC = 5 cm.
- What is the value of side BC, in a right angled triangle of side AC = 13.25 cm and AB = 8.75 cm.

Ratio

Introduction

It is the relation between two quantities of the same kind and is expressed as a fraction.

Expression

a, b two quantities of the same kind. $\frac{a}{b}$ or a:b or a ÷ b or

a in b is the ratio.

Ratio is always reduced to the lowest terms.

Example

$$7:14 = \frac{7}{14} = \frac{1}{2} = 1:2$$

Proportion

It is the equality between the ratios, a : b is a ratio and c : d is another ratio. Both ratios are equal. Then

$$a : b :: c : d \text{ or } \frac{a}{b} = \frac{c}{d}$$

Example

$$250 : 2000 :: 1 : 8$$

Proportion fundamentals

If $\frac{a}{b} = \frac{c}{d}$ then

- $ad = bc$

- $\frac{a}{c} = \frac{b}{d}$

- $\frac{b}{a} = \frac{d}{c}$

- $\frac{a+b}{b} = \frac{c+d}{c}$ and $\frac{a+b}{a} = \frac{c+d}{c}$

- $\frac{a-b}{b} = \frac{c-d}{d}$

- $\frac{a+b}{b+d} = \frac{a}{c} = \frac{c}{d}$

$$3:4::6:8 \text{ or } \frac{3}{4} = \frac{6}{8}$$

- $3 \times 8 = 6 \times 4$

- $\frac{3}{6} = \frac{4}{8}$

- $\frac{4}{3} = \frac{8}{6}$

- $\frac{3+4}{4} = \frac{6+8}{8}$

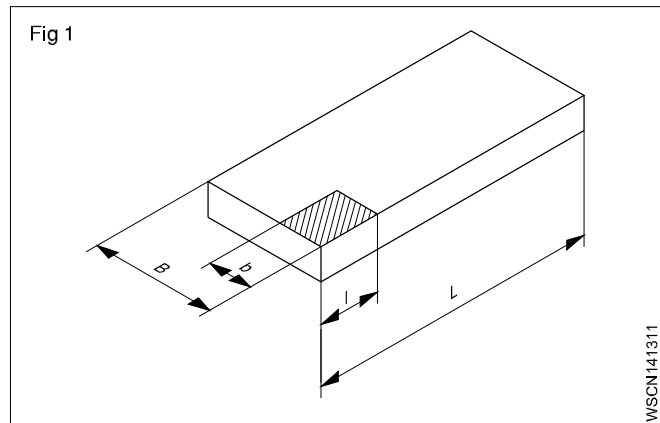
- $\frac{3-4}{4} = \frac{6-8}{8}$

- $\frac{3+6}{4+8} = \frac{9}{12} = \frac{3}{4}$

**Ratio - relation of two quantities of the same kind.
Proportion - equality between two ratios.**

Example

- A steel plate of 800 x 1400 mm is to be drawn to a scale of 1:20. What will be the lengths in the Fig 1

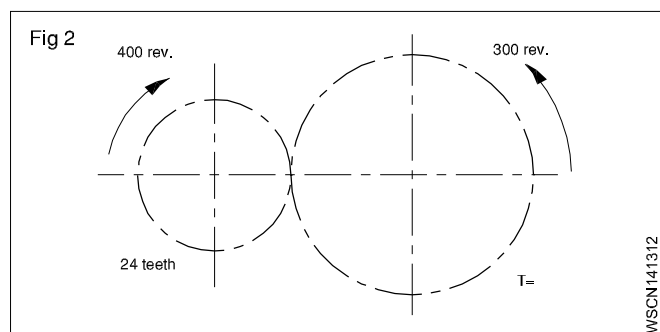


The reduction ratio is $\frac{1}{20}$.

B is reduced from 800 to $800 \times \frac{1}{20} = 40$ mm.

L is reduced from 1400 $\times \frac{1}{20} = 70$ mm.

- Find the number of teeth of the larger gear in the gear transmission shown in the Fig 2.



Speed ratio = 400 : 300

Teeth ratio = 24:T

$$\frac{400}{300} = \frac{T}{24}$$

$$\therefore T = \frac{24 \times 400}{300} = 32 \text{ Teeth}$$

Find the ratio of A:B:C

If A:B= 2:3 and B:C=4:5

$$A:B = 2:3$$

$$B:C = 4:5$$

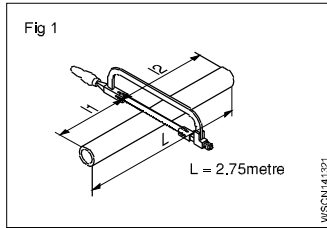
$$A:B = 8 : 12 \text{ (Ratio 2:3 multiply by 4)}$$

$$B:C = 12:15 \text{ (Ratio 4:5 multiply by 3)}$$

$$\therefore A:B:C = 8:12:15$$

Assignment

1



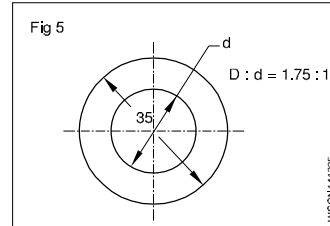
$$l_1 : l_2 = 2:3$$

$$L = 2.75 \text{ metres}$$

$$l_1 = \text{_____ metres}$$

$$l_2 = \text{_____ metres}$$

5

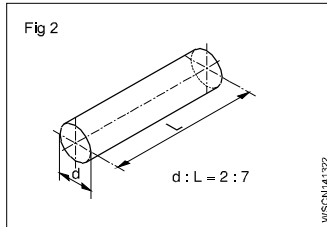


$$D : d = 1.75 : 1$$

$$D = 35 \text{ mm}$$

$$d = \text{_____ mm}$$

2

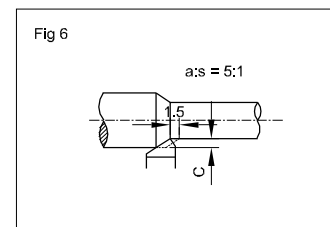


$$d : L \text{ of shaft} = 2:7$$

$$d = 40 \text{ mm}$$

$$L = \text{_____ mm}$$

6

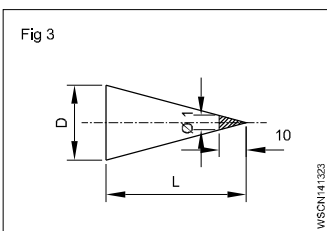


$$a : s = 5 : 1$$

$$s = 1.5 \text{ mm}$$

$$a = \text{_____ mm}$$

3



$$D : L = 1:10$$

$$L = 150 \text{ mm}$$

$$D = \text{_____ mm}$$

7 A:B=9:12

$$B:C=8:10$$

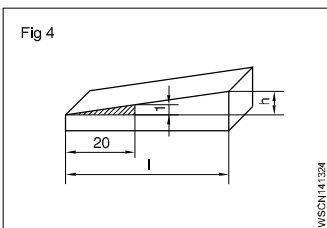
$$\text{Then } A:B:C = \text{_____}$$

8 A:B=5:6

$$B:C=3:4$$

$$\text{Then } A:B:C = \text{_____}$$

4



$$\frac{\Delta h}{l} = \frac{1}{20}$$

$$l = 140 \text{ mm}$$

$$\Delta h = \text{_____ mm}$$

9 A:55=9:11

$$A = \text{_____}$$

10 15:9.3=40:x

$$x = \text{_____}$$

Proportion

Description

It is the equality between the ratios, a:b is a ratio and c:d is another ratio. Both ratios are equal. Then

$$a : b :: c : d \text{ or } \text{ e.g. } 250 : 2000 :: 1 : 8$$

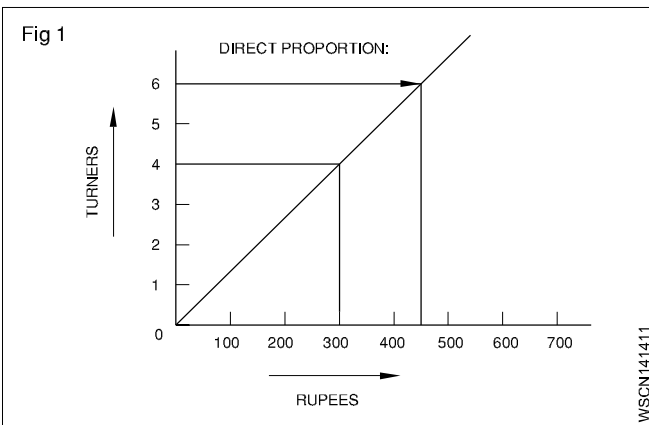
Rule of three

A three step calculation

- statement
- single
- multiple.

Direct proportion

The more in one the more in the other - An increase in one denomination produces an increase in the other. (Fig 1)



Example

4 turners earn 300 Rupees. How much will 6 Turners earn?

Statement

4 turners = 300 Rupees

Single

1 Turner = 75 Rupees

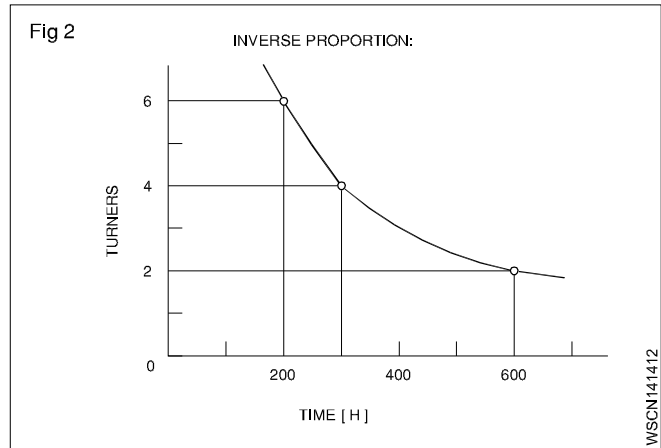
Multiple

6 Turners = 6 x 75 = 450 Rupees

Result - The more the more.

Indirect or inverse proportion

The more in one the lesser other - Increase in one quantity will produce a decrease in the other. (Fig 2)



Example

Four turners finish a job in 300 hours. How much time will 6 turners take to do the same job?

Solution procedure in three steps:

Statement

4 turners taken = 300 hours

The time will reduce if 6 turners to do the same job. Therefore this is inverse proportion.

$$\text{Multiple fraction } \frac{4 \text{ Turners}}{6 \text{ Turners}} \times 300 \text{ hours}$$

6 Turners = 200 hours

Result - The more the less.

Problems involving both

Example

Two turners need three days to produce 20 pieces. How long does it take for six turners to produce 30 such pieces?

Statement

2 turners, 20 piece = 3 days

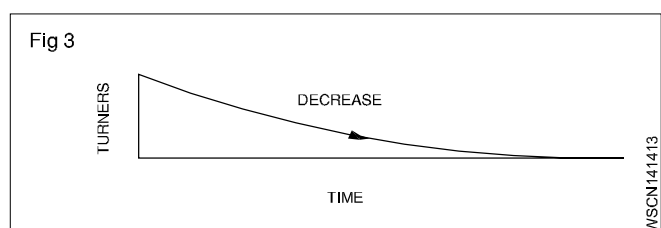
6 turners, 30 pieces = how many days.

First step (Fig 3)

Statement 2 turners for 20 pieces = 3 days

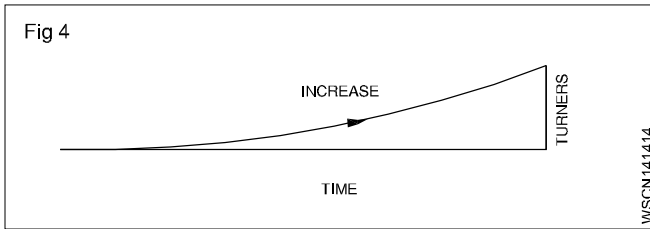
1 turner for 20 pieces = 3 x 2 = 6 days

$$\text{Multiple 6 turners for 20 pieces} = \frac{6}{6} = 1 \text{ day}$$



Inverse proportion - The more the less.

Second step (Fig 4)



Statement 6 turners for 20 pieces = 1 day

Single 6 turners for 1 piece = $\frac{1}{20}$ days

Multiple 6 turners for 30 pieces = $\frac{1}{20} \times 30 = 1.5$ days

Direct proportion - The more the more.

Solve the problem by first writing the statement and proceed to single and then to the multiple according to the type of proportion that is involved.

Introduction

Proportional fundamentals, as applicable to motor vehicle calculations are discussed below.

Simple Proportion

- Proportion

This is an equality between two ratios

Examples

- If one vehicle fleet uses 30 litres of petrol per day how much petrol is used by 6. Vehicles operating under similar condition.

One vehicle uses petrol = 30 litres per day.

Then six vehicles will use = 6 Times as much

$$= 6 \times 30 = 180 \text{ litres/day.}$$

- If 4 vehicles of a fleet use 120 gallons of petrol per day how much petrol will be used by 12 vehicles operating under the same condition.

4 vehicles use 120 gallons per day

1 Vehicle will use $\frac{120}{4} = 30$ gallons/day

12 vehicles will use $12 \times 30 = 360$ gallons/day

Both examples are called simple proportion because only two quantities were used and the day is common for both ratios.

Compound and Inverse proportions

- Compound proportions

Example

If 5 Fitter take 21 days to complete overhauling of 6 vehicles how long 7 Fitters will take to over haul 8 vehicles (Assume time of overhauling each vehicle is constant)

In this both direct and indirect proportions are used.

- 1 Fitter will over haul 1 vehicle in days (shorter time).
- Quantities (No. of days) are taken in last as that is the answer required in this case.

Ans: 7 Fitters will overhaul 8 vehicles in 20 days.

$$\left(\frac{21 \times 5}{6 \times 7} \times 8\right) = 20 \text{ days}$$

Inverse proportion

Some times proportions are taken inversely.

Examples

- If one water pump fills the fuel tank in 12 minutes, two pumps will take half the time taken.

The time should not be doubled.

- If two pumps take 30 minutes to fill up a tank how long will 6 similar pumps take this to fill this tank.

Ans: Time taken by 6 pumps = $\frac{30 \times 2}{6} = 10$ minutes

Proportional parts in combustion equation

Introduction

Proportion of quantities form an important factor in the combustion process of a fuel. The following happens during the combustion process.

Fuel is a hydro carbon substance. The combustion air is supplied from atmosphere and contains oxygen and nitrogen. Now the following chemical changes take place during combustion of a fuel.

- Carbon burns with oxygen and forms Co and Co₂ (Carbon monoxide and carbon dioxide.)
- Hydrogen burns with oxygen and becomes water (H₂O)
- Sulphur burns with oxygen and becomes sulphur dioxide.
- Nitrogen is an inert gas and does not take part in combustion.

Method of finding proportional parts in one lb of a substance

To be found out now

- Proportion of oxygen and hydrogen in one lb/Kg of water.
- Proportion of hydrogen and carbon in one lb/kg of fuel.

Examples

- The chemical formula for water is H_2O . This means 2 atoms of hydrogen and one atom of oxygen combined to make one molecule of water. If oxygen atom weighs 16 times as much as hydrogen find out the proportions in one kg of water.

Solution

Parts by weight of water are as below

$$\text{Oxygen} = 16/2 = 8\text{kg}$$

$$\text{Hydrogen} = 1/1 = 1\text{kg}$$

$$\text{Total} = 8+1= 9\text{kg}$$

- A hydrocarbon fuel has formula C_6H_{14} . This shows one molecule of fuel contain 6 atoms of carbon and 14 atoms of hydrogen. If the carbon atom weighs 12 times as the hydrogen atom, find the proportionate parts of hydrogen and carbon in one kg of fuel.

Solution

Parts of carbon by weight

$$= 6 \times 12 = 72$$

Parts of hydrogen by weight = 14.

$$\text{Total No. of parts} = 72 + 14 = 86.$$

$$\text{Weight of Carbon} = 72/86 = 0.8372 \text{ kg}$$

$$\text{Weight of Hydrogen} = 14/86 = 0.1628 \text{ kg}$$

Ratio and Proportion

Proportion of air quantity required for combustion process

Mass of air required for complete combustion of fuel depends on the following factors and is called Air - fuel Ratio

- Carbon, Hydrogen, Sulphur are to burn with oxygen in the combustion process.
- It has been found that the following quantities of air

(by wt) are required for this purpose to supply sufficient quantity of oxygen.

- For complete combustion of 1kg of carbon = of oxygen
- For complete combustion of 1 kg of hydrogen = 8kgs of oxygen
- For complete combustion of 1 kg of sulphur = 1 kg of oxygen
- Formula for calculation of mass of air for complete combustion.

Air contains 23% oxygen and 77% nitrogen

Mass of air = Mass of oxygen x for each constituent

$$\text{For Carbon} = 2 \frac{2}{3} \times \frac{100}{23} = 11.6\text{kg.of air}$$

$$\text{For hydrogen} = 8 \times \frac{100}{23} = 34.8\text{kg.of air}$$

$$\text{For sulphur} = 1 \times \frac{100}{23} = 4.35 \text{ kg.of air}$$

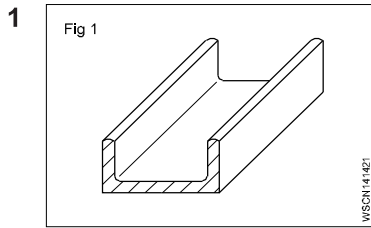
Total 50.75 Kg

Hence 50.75 kg of air is to be supplied to the engine for combustion of 1 kg of fuel.

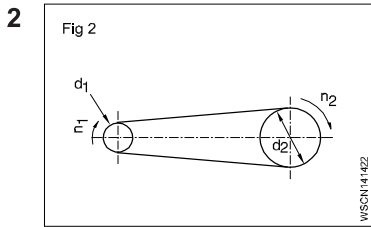
As the combustion process is not even more quantity of air than 50.7 kg is to be supplied to the engine.

The calculations involved in the combustion equations is beyond the scope of ITI students as it involves chemistry and physics for computing the proportions of different elements.

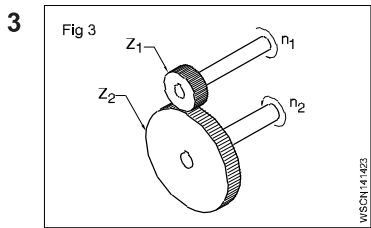
Assignment



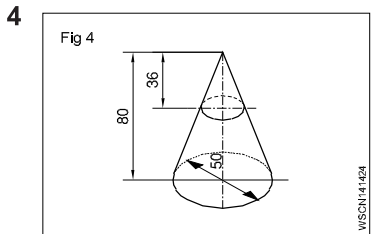
Length = 6.1 metre
Weight = 32 kgf
Weight of 1 metre of the same channel = _____ kgf



$d_1 = 120 \text{ mm}$
 $d_2 = 720 \text{ mm}$
 $n_1 = 1200 \text{ rpm}$
 $n_2 = \text{_____ rpm}$



$Z_1 = 42 \text{ T}$
 $n_2 = 96 \text{ rpm}$
 $n_1 = 224 \text{ rpm}$
 $Z_2 = \text{_____ T}$



$D = 50 \text{ mm}$
 $H = 80 \text{ mm}$
 $h = 36 \text{ mm}$
 $d = \text{_____ mm}$

- 5 If a mechanic assembles 8 machines in 3 days, how long he will take to assemble 60 machines.
- 6 In an autoshop the grinding wheel makes 1000 rpm and the driven pulley is 200 mm dia. If the driving pulley is 150 mm dia. Find out the rpm of the driving pulley.
- 7 In a gearing of a vehicle the following facts are found.
 A 180 mm dia of gear meshes with 60mm dia gear. If the bigger gear makes 60 rpm. What will be the rpm of smaller gear.
- 8 A vehicular job is completed by 5 mechanics in 4 days. If only 3 mechanics are available, in how many days the work can be completed.

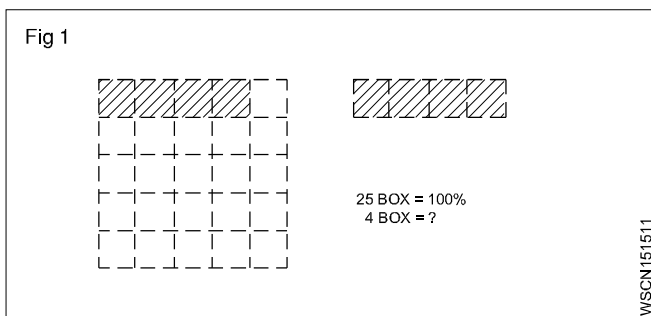
- 9 In a gearing arrangement of a vehicle a gear having 26 teeth is meshing with a gear of 52 teeth. The dia of 52 teeth gear is 200mm. Find out the diameter of 26 teeth gear wheel.
- 10 If two water pumps take 45 minutes to fill up a tank how long will 4 similar pumps will take to fill this tank.
- 11 In a belt-pulley drive the driving pulley is of 12 cm diameter and rotates at 360 rpm. Find the rpm of driven pulley whose diameter is 20 cm.
- 12 To overhaul a gear box, 12 mechanics are needed to complete the work in 5 days. If only 7 mechanics are available, how many days they will be able to complete the overhauling work.
- 13 Express in simple ratios the following
- a $45 \div 60$ b $40 \text{ paise} \div \text{Rs}4.00$
- c $\frac{20\text{mm}}{4 \text{ metres}}$ d $4^\circ\text{C} \div 100^\circ\text{C}$
- 14 Air contains 22% oxygen and 78% nitrogen by mass (weight). Calculate the quantity of air (mass of air) required for complete combustion of unit mass fuel (The main constituents that take part in combustion process are carbon, hydrogen and sulphur)
- Note: Given the following data (Solve the problem)
- a 1 kg of carbon requires $2\frac{2}{3}$ kg of oxygen.
- b 1 kg of hydrogen requires 8 kg of oxygen.
- c 1 kg of sulphur requires 1 kg of oxygen.
- 15 A fuel is a hydro carbon substance of C_7H_{14} . This shows each molecule of fuel contains 7 atoms of carbon and 14 atoms of hydrogen. If carbon atomic weight is 12 times greater than hydrogen atom, find out the proportionate parts of hydrogen and carbon in one kg of fuel.
- 16 A vehicle worth Rs.20,000/- can be insured at a cost of Rs.150/-. How much will it cost to insure a vehicle worth Rs.24000/- for one year and 3 month at the same rate. (Compound proportion)

Percentage

Percentage is a kind of fraction whose denominator is always 100. The symbol for percent is %, written after the number. e.g. 16%.

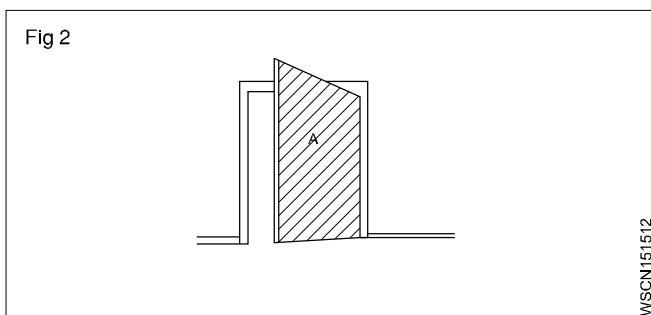
Ex.

In decimal form, it is 0.16. Percentage calculation also involves rule of three. The statement (the given data), for unit, and then to multiple which is for calculating the answer. (Fig 1)



Example

The amount of total raw sheet metal to make a door was 3.6 metre² and wastage was 0.18 metre². Calculate the % of wastage. (Fig 2)



Solution procedure in three steps.

Statement:

Area of door (A) = 3.6 m² = 100 %.

Wastage = 0.18 m²

Single: $\frac{100}{3.6} \times 1 \text{ m}^2$

Multiple: for 0.18 m² = $\frac{100}{3.6} \times 0.18$.

Wastage = 5%.

Conclusion

The three steps involved are,

- step one : describe the situation (availability)
- step two : decide for unit
- step three : proceed for the multiple.

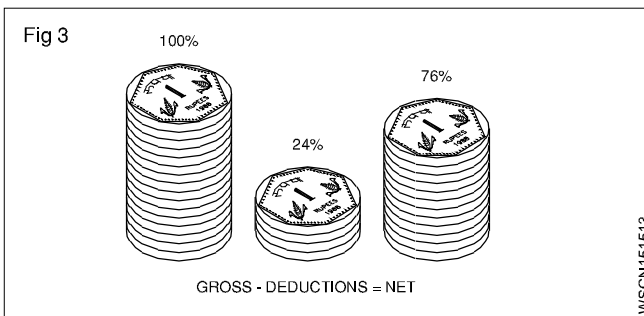
Analyse the given data and proceed to arrive at the answer through the unit.

Example

A fitter receives a take-home salary of 984.50 rupees.

If the deduction amounts to 24%, what is his total salary? (Fig 3)

Total pay 100%



Deduction 24%

Take home salary 76%

If the take home pay is Rs.76, his salary is 100.

For 1% it is $\frac{1}{76}$

For Rs.984.50, it is $\frac{1}{76} \times 984.50$.

For 100% it is $\frac{984.50}{76} \times 100 = 1295.39$

100% i.e. gross pay = Rs.1295.40.

Example 1

75 litres of oil is taken out from a oil barrel of 200 litres capacity. Find out the percentage taken in this.

Solution

% of oil taken = Oil taken out (litres) / Capacity of Barrel (litres) x 100

$$= \frac{75}{200} \times 100 = 37\frac{1}{2}\%$$

Example 2

A spare part is sold with 15%. Profit to a customer, to a price of Rs. 15000/-. Find out the following (a) What is the purchase price (b) What is the profit.

Solution: CP = x ,

CP = cost price

SP = sale price

SP=CP+15%of CP

$$15000 = x + \frac{15x}{100} = \frac{100x + 15x}{100}$$

$$x = \frac{1500000}{115} = 13043.47$$

Profit = SP-CP = 15000-13043.47 = 1956.53

Purchase price = Rs.13,043/,Profit = Rs. 1957

Example 3

Out of 80000 cars, which were tested on road, only 16000 cars had no fault. What is the percentage in this acceptance.

$$= \frac{160000}{80000} \times 100 = \frac{100}{5} = 20\%$$

Example 4

The price of a motor cycle dropped to 92% of original price and now sold at Rs.18000/- What was the original price.

Solution

Present price of Motor cycle Rs.18000

This is the value of 92% of original price

$$\text{Original Price} = 18000 \times \frac{100}{92} = \frac{1800000}{92}$$

= Rs.19565

Example 5

A Motor vehicle uses 100 litres of Petrol per day when travelling at 30 kmph. After top overhauling the consumption falls to 90 litres per day. Calculate percentage of saving.

Solution

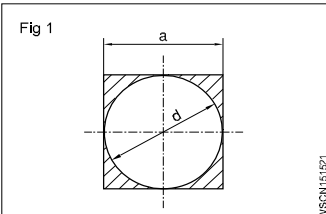
Percentage of saving = Decrease in consumption/Original consumption x 100

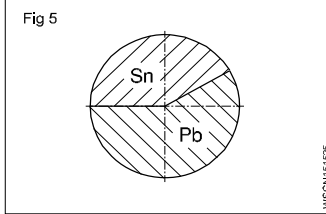
$$= (100 - 90) \frac{\text{litres}}{100} \times 100$$

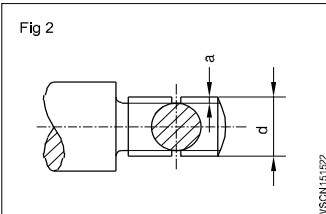
$$= \frac{10}{100} \times 100$$

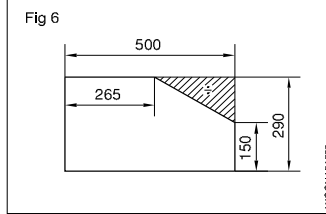
= 10% Saving in fuel.

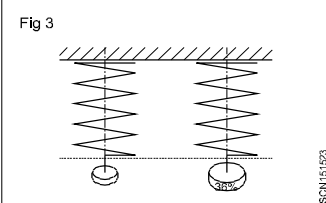
Assignment

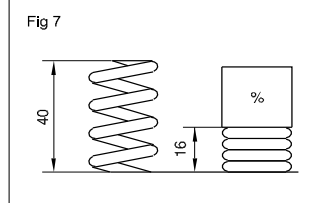
1  a = 400mm (side of square)
d = 400 mm
Wastage = _____ %.

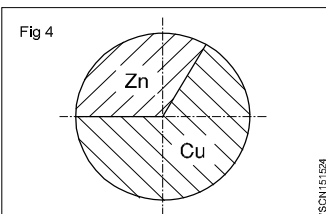
5  Weight of alloy = 140 Kgf
Weight of Sn 40%
Pb = _____ Kgf
Sn = _____ Kgf.

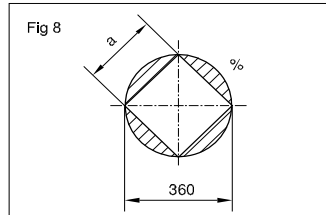
2  d = 26mm
'a' depth of u/cut = 2.4mm
reduction of area at cross-section = _____ %

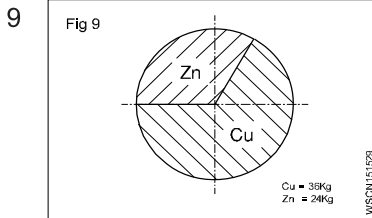
6  Shaded portion = _____ %.

3  Percentage of increase = 36%
Value of increase = 611.2 N/mm²
Original tensile strength = _____ N/mm².

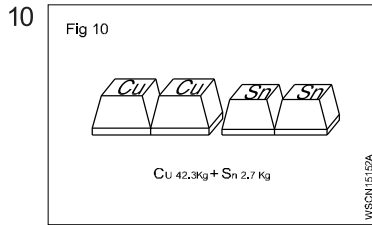
7  Compression length = _____ %.

4  Copper in alloy = 27 kg
Zinc in alloy = 18 kg
% of Copper = _____ %
% of Zinc = _____ %.

8  d = 360 mm
a = 0.707 x d
Wastage = _____ %.



Cu = 36 Kg
 Zn = 24 Kg
 Cu = _____ %
 Zn = _____ %



Cu = 42.3 Kg
 Sn = 2.7 Kg
 Cu _____ %
 Sn = _____ %

11 What is the selling price, If a trader buys a spare part for Rs.195/- This is 65% of selling price.

12 What is the purchase price if 25% profit is added to it, If a Motor cycle tyre is sold for Rs.300/-.

13 How many m³ of elements of air present in 120 m³ of air, If the composition of Air is 23% of Oxygen and 77% of Nitrogen.

14 How many kg of each of these elements are found. If an Engine bearing made of alloy of 40 kg consists of the following constituents.

- a) Copper (Cu) - 86%
- b) Tin (Sn) - 10%
- c) Zinc (Zn) - 4%

15 How much weight of these elements are found to exist. If a solder consists of 35%. Tin and 65% Lead. In a solder of 40 kg.

16 Find out the following:

- 1 Average consumption per journey.

2 Average consumption per mile.

3 Using the average consumption express maximum consumption as a percentage of the average correct to two decimal places. If the total petrol consumption of car on 4 different journeys each of 200 miles are found to be as 6.65, 7.5, 6.85, 7.05 gallons respectively.

17 In a Transport workshop, the following expenditure was found to be occurring on the capital income.

- 1 40% income spent on tyres
- 2 30% income spent on fuel and lubricants
- 3 10% income spent on spare parts

If the month end saving comes to Rs.2000/- what is the total income?

18 What is the final weight of the machined job if a casting weighs 80kg. During preliminary machining weight is reduced by 4% and final machining by 5%.

19 What is the weight of zinc, copper and tin, casting weight is 25kg. If a casting has 35% zinc, 40% copper and 25% tin.

20 What is the total weight of a solder, if solder consists of 35% tin 65% lead, and tin consists 14 grams.

21 What is the total annual income of the salesman, if a salesman gets a monthly pay of Rs.1000 and a commission of 2.5% on his sale. In one year sale amount is Rs.60,000.

22 What is the total income of a man, if he spends 15% of his income on agriculture, 21% on family, 24% on education of children and he saves Rs.360.

23 What is the percentage of his savings, if a person's monthly salary is Rs.450 and saves Rs.90 every month.

Percentage - Changing percentage to decimal and fraction Exercise 1.2.14

Conversion of Fraction into Percentage

1 Convert $\frac{1}{2}$ into percentage.

$$\begin{aligned}\text{Solution: } \frac{1}{2} \times 100 \\ &= 50\%\end{aligned}$$

2 Convert $\frac{1}{11}$ into percentage

$$\begin{aligned}\text{Solution: } \frac{1}{11} \times 100 &= \frac{100}{11} \\ &= 9.01\%\end{aligned}$$

Convert the following fraction into percentage.

1 $\frac{1}{4}$

2 $\frac{1}{5}$

3 $\frac{2}{3}$

4 $\frac{3}{8}$

Conversion of Percentage into Fraction

1 Convert 24% into fraction.

$$\text{Solution: } \frac{24}{100} = \frac{6}{25}$$

2 Convert $33\frac{1}{3}\%$ into fraction.

$$\begin{aligned}\text{Solution: } \frac{33\frac{1}{3}}{100} &= \frac{\frac{100}{3}}{100} = \frac{100}{3} \times \frac{1}{100} \\ &= \frac{1}{3}\end{aligned}$$

Convert the following percentage into fraction

1 15%

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

3 80%

4 12.5%

Conversion of Decimal Fraction into Percentage

1 Convert 0.35 into percentage.

$$\begin{aligned}\text{Solution: } 0.35 \times 100 \\ &= 35\%\end{aligned}$$

2 Convert 0.375 into percentage.

$$\begin{aligned}\text{Solution: } 0.375 \times 100 \\ &= 37.5\%\end{aligned}$$

Convert the following Decimal Fraction into Percentage

1 0.2

2 0.004

3 0.875

4 0.052

Conversion of Percentage into Decimal fraction

1 Convert 30% into decimal fraction.

$$\text{Solution: } \frac{30}{100} = 0.3$$

2 Convert $33\frac{1}{3}\%$ into decimal fraction.

$$\begin{aligned}\text{Solution: } \frac{33\frac{1}{3}}{100} &= \frac{\frac{100}{3}}{100} = \frac{100}{3} \times \frac{1}{100} \\ &= \frac{1}{3} = 0.333\end{aligned}$$

Convert the following percentage into decimal fraction

1 15%

2 7%

3 $12\frac{1}{2}\%$

4 90%