NCERT Solutions For Class 8 Maths

Chapter 10 - Proportional Reasoning II

Ganita Prakash Part 2 - Textbook Chapter 3

Figure it Out

Question 1: A cricket coach schedules practice sessions that include different activities in a specific ratio - time for warm-up/cool-down: time for hatting: time for bowling: time for fielding:: 3 : 4 : 3 : 5. If each session is 150 minutes long, how much time is spent on each activity?

Solution:

Given,

Time for warm-up/cool-down: time for batting: time for bowling: time for fielding = 3 : 4 : 3 : 5

Total number of ratio parts:

3 + 4 + 3 + 5 = 15

Total duration of each session = 150 minutes

Time represented by one part:

150 ÷ 15 = 10 minutes

Therefore,

Time for warm-up/cool-down = 3/15 × 150 = 30 minutes

- Time for batting = 4/15 × 150 = 40 minutes
- Time for bowling = 3/15 × 150 = 30 minutes
- Time for fielding = 5/15 × 150 = 50 minutes

Verification: 30 + 40 + 30 + 50 = 150 minutes

Hence, 30 minutes are spent on warm-up/cool-down, 40 minutes on batting, 30 minutes on bowling, and 50 minutes on fielding.

Question 2: A school library has books in different languages in the following ratio — no. of Odiya books : no. of Hindi books : no. of English books :: 3 : 2 : 1. If the library has 288 Odiya books, how many Hindi and English books does it have?

Solution:

Given,

No. of Odiya books : No. of Hindi books : No. of English books = 3 : 2 : 1

The number of Odiya books

= 3/6 × X

⇒ 288 = 3/6 × X

⇒ X = 576

Number of Hindi books:

2/6 × 576= 192

Number of English books:

1/6 × 576 = 96

Hence, the library has 192 Hindi books and 96 English books.

Question 3: I have 100 coins in the ratio - no. of ₹ 10 coins : no. of ₹ 5 coins : no. of ₹ 2 coins : no. of ₹ 1 coins :: 4 : 3 : 2 : 1. How much money do I have in coins?

Solution:

Given,

No. of ₹10 coins : No. of ₹5 coins : No. of ₹2 coins : No. of ₹1 coins = 4 : 3 : 2 : 1

Total number of ratio parts:

4 + 3 + 2 + 1 = 10

Total number of coins = 100

Number of coins represented by one part:

100 ÷ 10 = 10

Therefore,

- Number of ₹10 coins = 4/10 × 100 = 40
- Number of ₹5 coins = 3/10 × 100 = 30
- Number of ₹2 coins = 2/10 × 100 = 20
- Number of ₹1 coins = 1/10 × 100 = 10

Total value of the coins:

= 40 × ₹10 + 30 × ₹5 + 20 × ₹2 + 10 × ₹1

= ₹400 + ₹150 + ₹40 + ₹10

= ₹600

Hence, the total amount of money is ₹600.

Question 4: Construct a triangle with sidelengths in the ratio 3 : 4 : 5. Will all the triangles drawn with this ratio of sidelengths be congruent to each other? Why or why not?

Solution:

Triangles can be constructed with side lengths in the ratio 3 : 4 : 5.

For example:

- Triangle 1 may have sides 3 cm, 4 cm, and 5 cm.
- Triangle 2 may have sides 6 cm, 8 cm, and 10 cm.
- Triangle 3 may have sides 9 cm, 12 cm, and 15 cm.

Although the corresponding sides of all these triangles are in the ratio 3 : 4 : 5, their actual side lengths are different.

Congruent triangles must have the same shape and size. These triangles have the same shape but different sizes. Therefore, they are similar triangles, not congruent triangles.

Question 5: Can you construct a triangle with sidelengths in the ratio 1 : 3 : 5? Why or why not?

Solution:

For a triangle to be constructed, the sum of the lengths of any two sides must be greater than the length of the third side.

Let the side lengths be 1 cm, 3 cm, and 5 cm.

Checking the triangle inequality:

1 + 3 = 4, which is less than 5.

Since the sum of the two smaller sides is less than the third side, the triangle inequality is not satisfied.

Hence, a triangle with side lengths in the ratio 1 : 3 : 5 cannot be constructed.

3.5 A Slice of the Pie

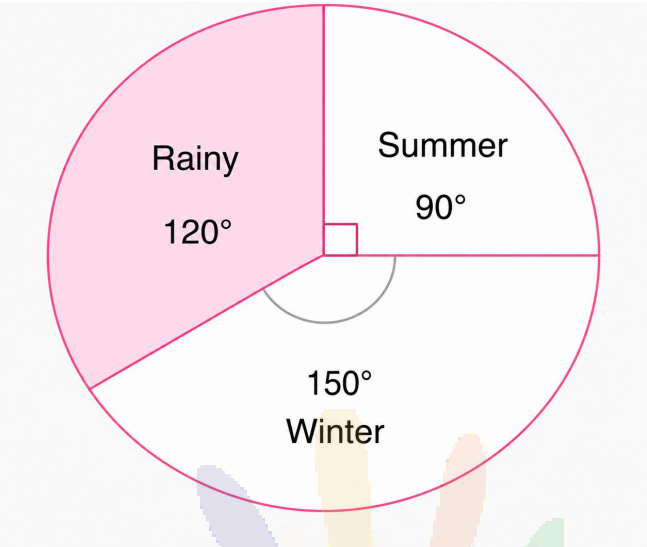
Question 1: A group of 360 people was asked to vote for their favourite season from the three seasons: rainy, winter, and summer. 90 liked the summer season, 120 liked the rainy season, and the rest liked the winter. Draw a pie chart to show this information.

Solution:

Total number of people = 360

Number of people who liked summer = 90

Number of people who liked the rainy season = 120



Number of people who liked winter:

= 360 − (90 + 120)

= 360 − 210

= 150

The central angle for each category is calculated using:

Central angle = Number of people/Total number of people × 360°

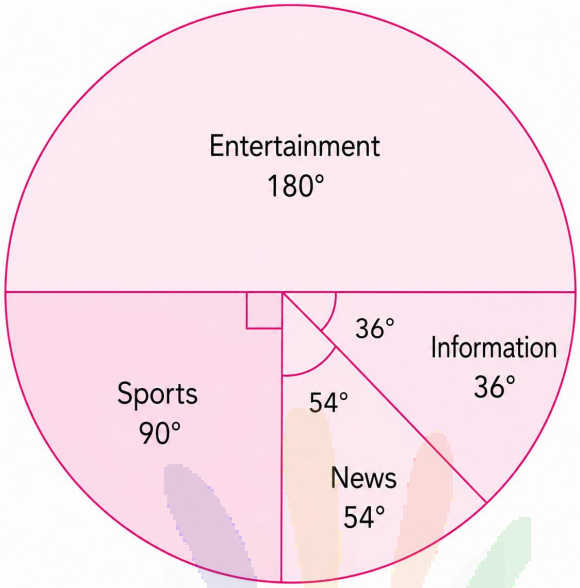
- Summer: 90/360 × 360° = 90°
- Rainy season: 120/360 × 360° = 120°
- Winter: 150/360 × 360° = 150°
- Verification: 90° + 120° + 150° = 360°

Therefore, the pie chart should have sectors of 90° for summer, 120° for the rainy season, and 150° for winter.

Question 2: Draw a pie chart based on the following information about viewers' favourite type of TV channel:
Entertainment — 50%, Sports — 25%, News — 15%, Information — 10%.

Solution:

The central angle for each category is calculated using:



Central angle = Percentage/100 × 360°

- Entertainment: 50/100 × 360° = 180°
- Sports: 25/100 × 360° = 90°
- News: 15/100 × 360° = 54°
- Information: 10/100 × 360° = 36°
- Verification: 180° + 90° + 54° + 36° = 360°

Therefore, the pie chart should have sectors of 180° for entertainment, 90° for sports, 54° for news, and 36° for information.

Question 3: Prepare a pie chart that shows the favourite subjects of the students in your class. You can collect the data on the number of students for each subject shown in the table (each student should choose only one subject). Then write these numbers in the table and construct a pie chart:

Subject	Language	Arts Education	Vocational Education	Social Science	Physical Education	Maths	Science
Number of Students							

Solution:

Subject	Language	Arts Education	Vocational Education	Social Science	Physical Education	Maths	Science
Number of Students	4	6	9	3	10	12	16

Based on the collected data:

Language = 4 students

Arts Education = 6 students

Vocational Education = 9 students

Social Science = 3 students

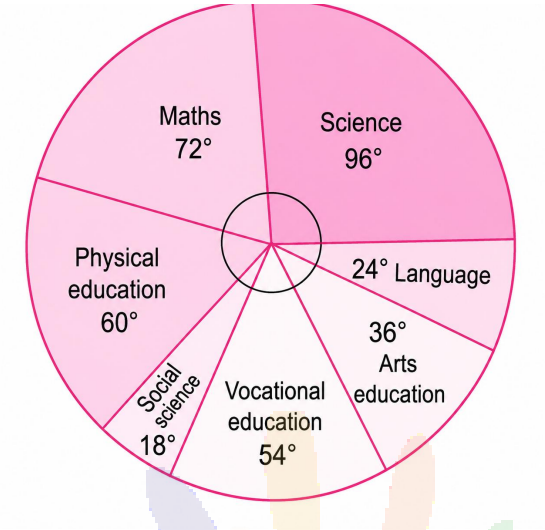
Physical Education = 10 students

Maths = 12 students

Science = 16 students

Total number of students:

4 + 6 + 9 + 3 + 10 + 12 + 16 = 60



Central angle = Number of students/60 × 360°

Angle for Language:

4/60 × 360° = 24°

Angle for Arts Education:

6/60 × 360° = 36°

Angle for Vocational Education:

9/60 × 360° = 54°

Angle for Social Science:

3/60 × 360° = 18°

Angle for Physical Education:

10/60 × 360° = 60°

Angle for Maths:

12/60 × 360° = 72°

Angle for Science:

16/60 × 360° = 96°

Verification:

$24° + 36° + 54° + 18° + 60° + 72° + 96° = 360°$

The pie chart can be constructed using these central angles.

3.6 Inverse Proportions

Question 1: Which of these are in inverse proportion?

(i)

x	40	80	25	16
y	20	10	32	50

(ii)

x	40	80	25	16
y	20	10	12.5	8

(iii)

x	30	90	150	10
y	15	5	3	45

Solution:

For two quantities x and y to be in inverse proportion, the product xy must remain constant.

(i)

$40 \times 20 = 800$

$80 \times 10 = 800$

$25 \times 32 = 800$

$16 \times 50 = 800$

Since all the products are equal to 800, x and y are in inverse proportion.

(ii)

$40 \times 20 = 800$

$80 \times 10 = 800$

$25 \times 12.5 = 312.5$

$16 \times 8 = 128$

Since the products are not equal, x and y are not in inverse proportion.

(iii)

$30 \times 15 = 450$

$90 \times 5 = 450$

$150 \times 3 = 450$

$10 \times 45 = 450$

Since all the products are equal to 450, x and y are in inverse proportion.

Hence, the quantities in (i) and (iii) are in inverse proportion.

Question 2: Fill in the empty cells if x and y are in inverse proportion.

x	16	12		36
y	9		48	

Solution:

x	16	12	x_3	36
y	9	y_2	48	y_4

$\because$ x and y are in inverse proportion.

$\therefore \quad 16 \times 9 = 12 \times y_2$

$$\Rightarrow \quad y_2 = \frac{16 \times 9}{12} = 12$$

$\therefore \quad 16 \times 9 = x_3 \times 48$

$$\Rightarrow \quad x_3 = \frac{16 \times 9}{48} = 3$$

And

$$16 \times 9 = 36 \times y_4$$

$$\Rightarrow \quad y_4 = \frac{16 \times 9}{36} = 4 \quad \Rightarrow \quad y_4 = 4$$

Figure It Out

Question 1: Which of the following pairs of quantities are in inverse proportion?
(i) The number of taps filling a water tank and the time taken to fill it.
(ii) The number of painters hired and the days needed to paint a wall of fixed size.
(iii) The distance a car can travel and the amount of petrol in the tank.
(iv) The speed of a cyclist and the time taken to cover a fixed route.
(v) The length of cloth bought and the price paid at a fixed rate per metre.
(vi) The number of pages in a book and the time required to read it at a fixed reading speed.

Solution:

(i) When the number of taps increases, the time taken to fill the tank decreases. For example, if the number of identical taps doubles, the time becomes half.

Hence, the number of taps and the time taken are in inverse proportion.

(ii) When the number of painters increases, the number of days needed to paint a fixed wall decreases.

Hence, the number of painters and the number of days are in inverse proportion.

(iii) At a fixed mileage, more petrol allows a car to travel a greater distance, while less petrol allows it to travel a shorter distance.

Therefore, the distance a car can travel and the amount of petrol available are in direct proportion, not inverse proportion.

(iv) For a fixed route, increasing the cyclist's speed decreases the time taken. If the speed doubles, the time becomes half.

Hence, speed and time are in inverse proportion.

(v) At a fixed price per metre, buying more cloth increases the total price.

Therefore, the length of cloth and the price paid are in direct proportion.

(vi) At a fixed reading speed, a book with more pages takes more time to read.

Therefore, the number of pages and the reading time are in direct proportion.

Hence, the pairs in (i), (ii), and (iv) are in inverse proportion.

Question 2: If 24 pencils cost ₹ 120, how much will 20 such pencils cost?

Solution:

The number of pencils and their cost are in direct proportion.

Cost of one pencil:

₹120 ÷ 24 = ₹5

Cost of 20 pencils:

20 × ₹5 = ₹100

Hence, 20 pencils will cost ₹100.

Question 3: A tank on a building has enough water to supply 20 families living there for 6 days. If 10 more families move in there, how long will the water last? What assumptions do you need to make to work out this problem?

Solution:

Initially, the number of families = 20

Number of days the water lasts = 6

After 10 more families move in:

Total number of families = 20 + 10 = 30

The number of families and the number of days for which the water lasts are in inverse proportion.

Let the water last for x days.

20 × 6 = 30 × x

120 = 30x

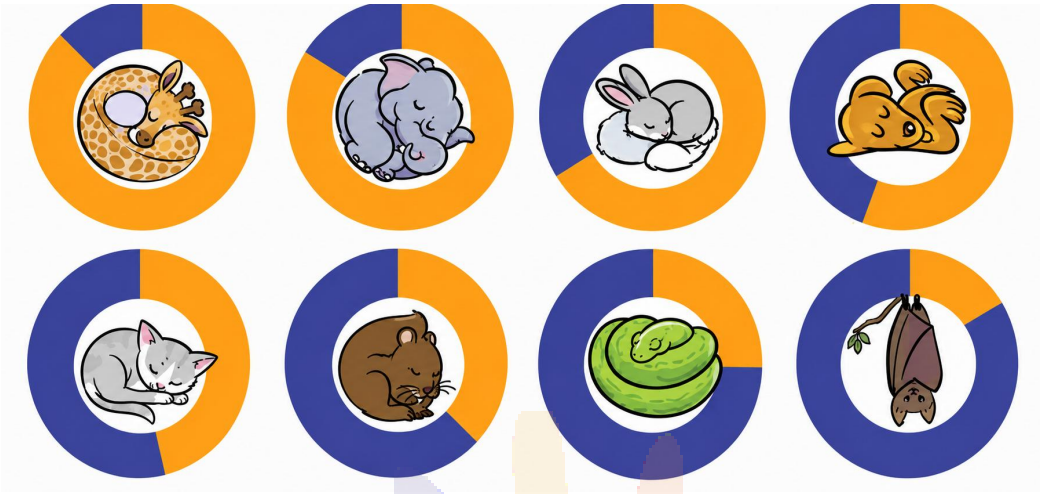
x = 4

Hence, the water will last for 4 days.

Assumptions needed:

1. Every family uses the same amount of water each day.
2. The daily water consumption of each family remains constant.
3. No additional water is added to the tank.
4. There is no leakage or wastage of water.

Question 4: Fill in the average number of hours each living being sleeps in a day by looking at the charts. Select the appropriate hours from this list: 15, 2.5, 20, 8, 3.5, 13, 10.5, 18.



Solution:

The average sleeping hours are:

Giraffe = 2.5 hours

Elephant = 3.5 hours

Boy = 8 hours

Dog = 10.5 hours

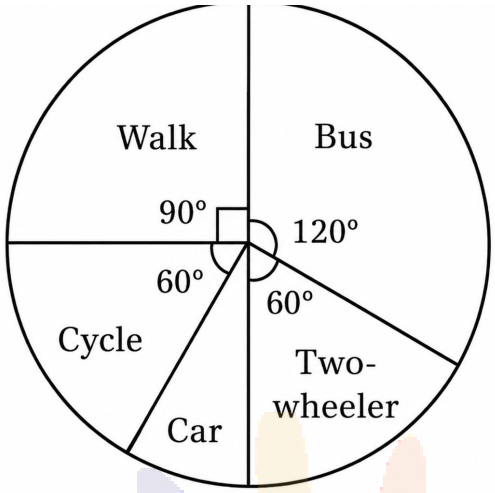
Cat = 13 hours

Squirrel = 15 hours

Snake = 18 hours

Bat = 20 hours

Question 5: The pie chart given below shows the result of a survey carried out to find the modes of transport used by children to go to school.



Study the pie chart and answer the following questions.
(i) What is the most common mode of transport?
(ii) What fraction of children travel by car?
(iii) If 18 children travel by car, how many children took part in the survey? How many children use taxis to travel to school?
(iv) By which two modes of transport are equal numbers of children travelling?

Solution:

The angles shown in the pie chart are:

- Walk = 90°
- Bus = 120°
- Cycle = 60°

Two-wheeler = 60°

Car = 360° − (90° + 120° + 60° + 60°)

Car = 30°

(i) What is the most common mode of transport?

The largest sector is 120°, which represents the bus.

Hence, the bus is the most common mode of transport.

(ii) What fraction of children travel by car?

Fraction travelling by car:

30°/360° = 1/12

Hence, 1/12 of the children travel by car.

(iii) If 18 children travel by car, how many children took part in the survey? How many children use taxis to travel to school?

Let the total number of children be x.

Since 1/12 of the children travel by car:

1/12 × x = 18

x = 18 × 12

x = 216

Hence, 216 children took part in the survey.

The pie chart does not contain a separate category for taxis. Therefore, the number of children travelling by taxi cannot be determined from the given chart.

(iv) By which two modes of transport are equal numbers of children travelling?

The sectors for the cycle and the two-wheeler are both 60°.

Hence, an equal number of children travel by cycle and two-wheeler.

Question 6: Three workers can paint a fence in 4 days. If one more worker joins the team, how many days will it take them to finish the work? What are the assumptions you need to make?

Solution:

Initially:

Number of workers = 3

Number of days = 4

After one more worker joins:

Number of workers = 4

The number of workers and the number of days are in inverse proportion.

Let the required number of days be x.

$3 \times 4 = 4 \times x$

$12 = 4x$

$x = 3$

Hence, four workers will complete the work in 3 days.

Assumptions needed:

1. All workers work at the same rate.
2. The work is divided equally among the workers.
3. All workers work for the same number of hours each day.
4. Their working efficiency remains constant.

Question 7: It takes 6 hours to fill 2 tanks of the same size with a pump. How long will it take to fill 5 such tanks with the same pump?

Solution:

The number of tanks and the time taken are in direct proportion.

Time required to fill one tank:

$6 \div 2 = 3$ hours

Time required to fill five tanks:

$5 \times 3 = 15$ hours

Hence, it will take 15 hours to fill five tanks.

Question 8: A given set of chairs is arranged in 25 rows, with 12 chairs in each row. If the chairs are rearranged with 20 chairs in each row, how many rows does this new arrangement have?

Solution:

Total number of chairs:

$25 \times 12 = 300$

Let the number of new rows be x.

Since each new row contains 20 chairs:

$20x = 300$

$x = 300 \div 20$

$x = 15$

Hence, the new arrangement will have 15 rows.

Question 9: A school has 8 periods a day, each of 45 minutes duration. How long is each period, if the school has 9 periods a day, assuming that the number of school hours per day stays the same?

Solution:

Total duration of the school day:

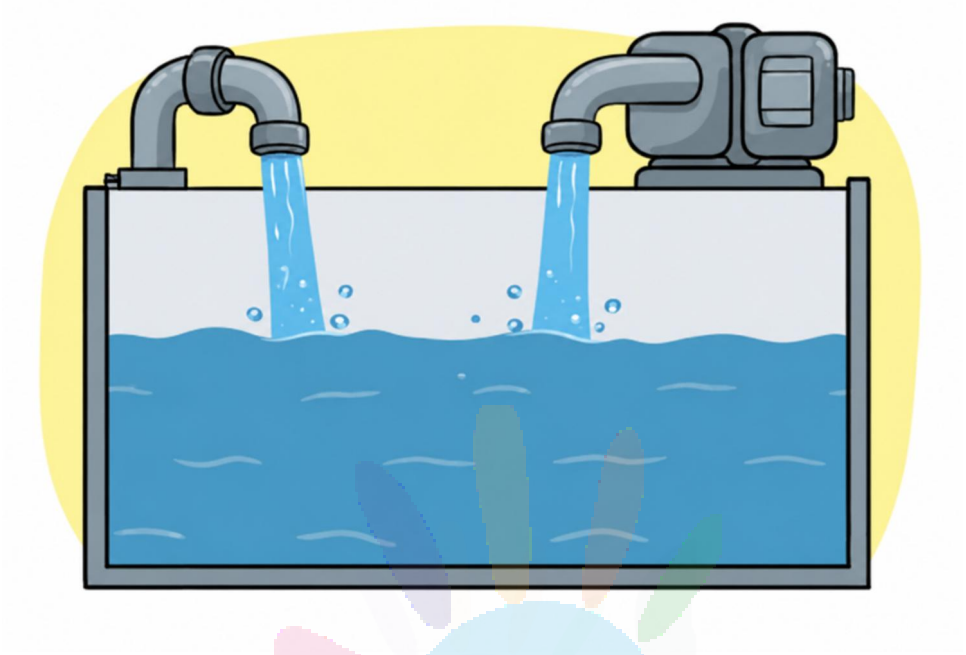
$8 \times 45 = 360$ minutes

If there are 9 periods, the duration of each period is:

$360 \div 9 = 40$ minutes

Hence, each period will be 40 minutes long.

Question 10: A small pump can fill a tank in 3 hours, while a large pump can fill the same tank in 2 hours. If both pumps are used together, how long will the tank take to fill?



Solution:

The small pump fills 1/3 of the tank in one hour.

The large pump fills 1/2 of the tank in one hour.

Together, the part of the tank filled in one hour is:

1/3 + 1/2

= 2/6 + 3/6

= 5/6

Therefore, the time required to fill the complete tank is:

1 ÷ 5/6

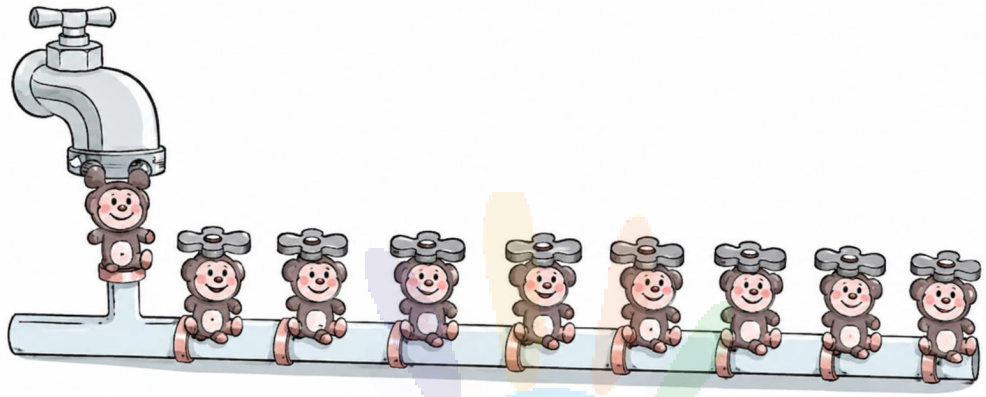
= 6/5 hours

= 1.2 hours

0.2 hour = 0.2 × 60 = 12 minutes

Hence, both pumps together will fill the tank in 1 hour and 12 minutes.

Question 11: A factory requires 42 machines to produce a given number of toys in 63 days. How many machines are required to produce the same number of toys in 54 days?



Solution:

The number of machines and the number of days are in inverse proportion.

Let the required number of machines be x.

$42 \times 63 = x \times 54$

$x = 42 \times 63/54$

$x = 49$

Hence, 49 machines are required to produce the same number of toys in 54 days.

Question 12: A car takes 2 hours to reach a destination, travelling at a speed of 60 km/h. How long will the car take if it travels at a speed of 80 km/h?

Solution:

For a fixed distance, speed and time are in inverse proportion.

Let the required time be t hours.

$60 \times 2 = 80 \times t$

$120 = 80t$

$t = 120/80$

$t = 1.5$ hours

Therefore, the car will take 1.5 hours, or 1 hour and 30 minutes, to reach the destination.