Mathematics NCERT Grade 6, Chapter 12: **Ratio and proportion** - This chapter will explain in detail about **ratios**. Emphasis will also be laid upon **proportions**. Firstly the topic **Ratios** is discussed. Solved examples are given in the chapter for a better explanation.

- Two **quantities** can be compared only if they are in the same **unit**.
- For **comparing quantities** of the same type, we commonly use the method of taking **difference between the quantities.**
- Sometimes the **comparison** is made by using **division.**
- For **comparison** by ratio, the **two quantities** must be in the **same ratio**.
- We can get **equivalent ratios** by multiplying or dividing the **numerator** and **denominator** by the same **number.**

The next section is about **Proportion.**

- If two **ratios** are equal, we say that they are in **proportion** and use the symbol **'::'** or **'='** to equate the two **ratios.**
- If two **ratios** are not equal, then we say that they are not in **proportion.** In a statement of proportion, the four **quantities** involved when taken in order are known as **respective terms**. First and fourth **terms** are known as **extreme terms.** Second and third terms are known as **middle terms.**

After that, the **Unitary method** will be explained. This topic is very important from the examination point of view and also it can be of great use in daily life. The last exercise is 12.3 which contains 11 questions based on the **unitary method.**

- The method in which first we find the value of one unit and then the value of required number of units is known as **Unitary Method**.

In the end, the key points of the chapter are explained.

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Question 1:

There are 20 girls and 15 boys in a class.

(a) What is the ratio of number of girls to the number of boys?

(b)What is the ratio of number of girls to the total number of students in the class?

ANSWER:

Number of girls = 20

Number of boys = 15

Total number of students = 20 + 15 = 35

(a) Ratio of number of girls to boys = $\frac{20}{15}=\frac{4}{3}$

(b) Ratio of number of girls to total students = $\frac{20}{35}=\frac{4}{7}$

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Question 2:

Out of 30 students in a class, 6 like football, 12 like cricket and remaining like tennis. Find the ratio of

(a) Number of students liking football to number of students liking tennis.

(b) Number of students liking cricket to total number of students.

ANSWER:

Number of students who like football = 6

Number of students who like cricket = 12

Number of students who like tennis = 30 − 6 − 12 = 12

(a) Ratio of the number of students liking football to the number of students liking tennis = $\frac{6}{12}=\frac{1}{2}$

(b) Ratio of the number of students liking cricket to the total number of

students = $\frac{12}{30}=\frac{2}{5}$

Video Solution for ratio and proportion (Page: 251 , Q.No.: 2)

NCERT Solution for Class 6 math - ratio and proportion 251 , Question 2

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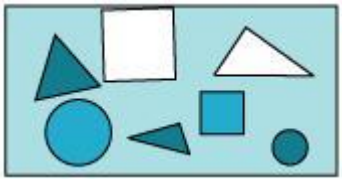
Question 3:

See the figure and find the ratio of



(a) Number of triangles to the number of circles inside the rectangle.

(b) Number of squares to all the figures inside the rectangle.

(c) Number of circles to all the figures inside the rectangle.

ANSWER:

Number of triangles = 3

Number of circles = 2

Number of squares = 2

Total number of figures = 7

(a) Ratio of the number of triangles to the number of circles = $\frac{3}{2}$

(b) Ratio of the number of squares to all the figures in the rectangle = $\frac{2}{7}$

(c) Ratio of the number of circles to all the figures in the rectangle = $\frac{2}{7}$

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Question 4:

Distances travelled by Hamid and Akhtar in an hour are 9 km and 12 km. Find the ratio of speed of Hamid to the speed of Akhtar.

ANSWER:

The distance travelled in an hour by a certain object is called the speed of that object.

Distance travelled by Hamid in one hour = 9 km

Distance travelled by Akhtar in one hour = 12 km

Hamid's speed = 9 km/hr

Akhtar's speed = 12 km/hr

$$\text{Ratio of speed of Hamid to the speed of Akhtar} = \frac{9}{12} = \frac{3}{4}$$

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Question 5:

Fill in the following blanks:

$\frac{15}{18}=\frac{\square}{6}=\frac{10}{\square}=\frac{\square}{30}$ [Are these equivalent ratios?]

ANSWER:

$\frac{15}{18}=\frac{5\times3}{6\times3}=\frac{5}{6}$

$\frac{5}{6}=\frac{5}{6}\times\frac{2}{2}=\frac{10}{12}$

$\frac{5}{6}=\frac{5}{6}\times\frac{5}{5}=\frac{25}{30}$

Therefore, 5, 12, 25 will come in the blanks respectively.

Yes, all these are equivalent ratios.

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Question 6:

Find the ratio of the following:

(a) 81 to 108 (b) 98 to 63

(c) 33 km to 121 km (d) 30 minutes to 45 minutes

ANSWER:

(a) $\frac{81}{108}=\frac{3\times3\times3\times3}{2\times2\times3\times3\times3}=\frac{3}{4}$

(b) $\frac{98}{63}=\frac{14\times7}{9\times7}=\frac{14}{9}$

(c) $\frac{33}{121}=\frac{3\times11}{11\times11}=\frac{3}{11}$

(d) $\frac{30}{45}=\frac{2\times3\times5}{3\times3\times5}=\frac{2}{3}$

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Question 7:

Find the ratio of the following:

(a) 30 minutes to 1.5 hours (b) 40 cm to 1.5 m

(c) 55 paise to Re1 (d) 500 mL to 2 litres

ANSWER:

(a) 30 min = $\frac{30}{60} = 0.5$ hours

Required ratio = $\frac{0.5}{1.5} = \frac{0.5 \times 1}{0.5 \times 3} = \frac{1}{3}$

(b) 40 cm to 1.5 m

1.5 m = 150 cm

Required ratio = $\frac{40}{150} = \frac{4}{15}$

(c) 55 paise to Re 1

Re 1 = 100 paise

Required ratio = $\frac{55}{100} = \frac{11 \times 5}{20 \times 5} = \frac{11}{20}$

(d) 500 mL to 2*l*

1*l* = 1000 mL

2*l* = 2000 mL

Required ratio = $\frac{500}{2000} = \frac{5}{20} = \frac{5}{5 \times 4} = \frac{1}{4}$

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Question 8:

In a year, Seema earns Rs 1, 50, 000 and saves Rs 50, 000. Find the ratio of

(a) Money that Seema earns to the money she saves.

(b) Money that she saves to the money she spends.

ANSWER:

Money earned = Rs 150000

Money saved = Rs 50000

Money spent = Rs 150000 − Rs 50000 = Rs 100000

(a) Ratio of money earned to money saved = $\frac{150000}{50000} = \frac{3}{1}$

(b) Ratio of money saved to money spent = $\frac{50000}{100000} = \frac{1}{2}$

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Question 9:

There are 102 teachers in a school of 3300 students. Find the ratio of the number of teachers to the number of students.

ANSWER:

Ratio required = $\frac{102}{3300} = \frac{2\times3\times17}{2\times3\times550} = \frac{17}{550}$

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Question 10:

In a college, out of 4320 students, 2300 are girls. Find the ratio of

(a) Number of girls to the total number of students.

(b) Number of boys to the number of girls.

(c) Number of boys to the total number of students.

ANSWER:

Total number of students = 4320

Number of girls = 2300

Number of boys = 4320 − 2300 = 2020

(a) Required ratio = $\frac{2300}{4320} = \frac{2\times2\times5\times115}{2\times2\times5\times216} = \frac{115}{216}$

(b) Required ratio = $\frac{2020}{2300} = \frac{2\times2\times5\times101}{2\times2\times5\times115} = \frac{101}{115}$

(c) Required ratio = $\frac{2020}{4320} = \frac{2\times2\times5\times101}{2\times2\times5\times216} = \frac{101}{216}$

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Question 11:

Out of 1800 students in a school, 750 opted basketball, 800 opted cricket and remaining opted table tennis. If a student can opt only one game, find the ratio of

(a) Number of students who opted basketball to the number of students who opted table tennis.

(b) Number of students who opted cricket to the number of students opting basketball.

(c) Number of students who opted basketball to the total number of students.

ANSWER:

(a) Required ratio = $\frac{750}{250} = \frac{3}{1}$

(b) Required ratio = $\frac{800}{750} = \frac{16}{15}$

(c) Required ratio = $\frac{750}{1800} = \frac{25}{60} = \frac{5}{12}$

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Question 12:

Cost of a dozen pens is Rs 180 and cost of 8 ball pens is Rs 56. Find the ratio of the cost of a pen to the cost of a ball pen.

ANSWER:

Cost of a dozen pens = Rs 180

Cost of 1 pen = $\frac{180}{12} = \text{Rs } 15$

Cost of 8 ball pens = Rs 56

Cost of a ball pen = $\frac{56}{8} = \text{Rs } 7$

Required ratio = $\frac{15}{7}$

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Question 13:

Consider the statement: Ratio of breadth and length of a hall is 2 : 5. Complete the following table that shows some possible breadths and lengths of the hall.

Breadth of the hall (in metres)	10	?	40
Length of the hall (in metres)	25	50	?

ANSWER:

(i) Length = 50 m

$$\frac{\text{Breadth}}{50}=\frac{2}{5}$$

5 × Breadth = 50 × 2 (By cross-multiplication)

Breadth = 20 m

(ii) Breadth = 40 m

$$\frac{40}{\text{Length}}=\frac{2}{5}$$

2 × Length = 5 × 40 (By cross-multiplication)

Length = 100 m

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Question 14:

Divide 20 pens between Sheela and Sangeeta in the ratio of 3:2.

ANSWER:

Terms of 3 : 2 are 3 and 2.

Sum of these terms = 3 + 2 = 5

Sheela will get $\frac{3}{5}$ of total pens and Sangeeta will get $\frac{2}{5}$ of total pens.

Number of pens with Sheela = $\frac{3}{5}\times 20=12$

Number of pens with Sangeeta = $\frac{2}{5}\times 20=8$

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Question 15:

Mother wants to divide Rs 36 between her daughters Shreya and Bhoomika in the ratio of their ages. If age of Shreya is 15 years and age of Bhoomika is 12 years, find how much Shreya and Bhoomika will get.

ANSWER:

Ratio of ages = $\frac{15}{12}=\frac{5}{4}$

Therefore, mother wants to divide Rs 36 in a ratio of 5 : 4.

Terms of 5 : 4 are 5 and 4.

Sum of these terms = 5 + 4 = 9

Shreya will get $\frac{5}{9}$ of the total money and Bhoomika will get $\frac{4}{9}$ of it.

Amount that Shreya will get = $\frac{5}{9}\times 36=20$

Amount that Bhoomika will get = $\frac{4}{9}\times 36=16$

Therefore, Shreya and Bhoomika will get Rs 20 and Rs 16 respectively.

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Question 16:

Present age of father is 42 years and that of his son is 14 years. Find the ratio of

(a) Present age of father to the present age of son.

(b) Age of the father to the age of son, when son was 12 years old.

(c) Age of father after 10 years to the age of son after 10 years.

(d) Age of father to the age of son when father was 30 years old.

ANSWER:

(a) Present age of father = 42 years

Present age of son = 14 years

Required ratio = $\frac{42}{14}=\frac{3}{1}$

(b) Two years ago, the age of the son was 12 years and the age of the father was 42 − 2 = 40 years

Required ratio = $\frac{40}{12}=\frac{4\times10}{4\times3}=\frac{10}{3}$

(c) After 10 years, the age of the father and son will be 52 years and 24 years respectively.

Required ratio = $\frac{52}{24}=\frac{4\times13}{4\times6}=\frac{13}{6}$

(d) 12 years ago, the father was 30 years old.

At that time, age of son = 14 − 12 = 2 years

Required ratio = $\frac{30}{2}=\frac{2\times15}{2}=\frac{15}{1}$

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Question 1:

Determine if the following are in proportion.

(a) 15, 45, 40, 120 (b) 33, 121, 9, 96

(c) 24, 28, 36, 48 (d) 32, 48, 70, 210

(e) 4, 6, 8, 12 (f) 33, 44, 75, 100

ANSWER:

(a) 15, 45, 40, 120

$\frac{15}{45}=\frac{1}{3}, \frac{40}{120}=\frac{1}{3}$

Therefore, 15: 45 = 40: 120

Hence, these are in proportion.

(b) 33, 121, 9, 96

$\frac{33}{121}=\frac{3}{11}, \frac{9}{96}=\frac{3}{32}$

Therefore, 33: 121 ≠ 9: 96

Hence, these are not in proportion.

(c) 24, 28, 36, 48

$\frac{24}{28}=\frac{6}{7}, \frac{36}{48}=\frac{3}{4}$

Therefore, 24: 28 ≠ 36: 48

Hence, these are not in proportion.

(d) 32, 48, 70, 210

$\frac{32}{48}=\frac{2}{3}, \frac{70}{210}=\frac{1}{3}$

Therefore, 32: 48 ≠ 70: 210

Hence, these are not in proportion.

(e) 4, 6, 8, 12

$\frac{4}{6}=\frac{2}{3}, \frac{8}{12}=\frac{2}{3}$

Therefore, 4: 6 = 8: 12

Hence, these are in proportion.

(f) 33, 44, 75, 100

$\frac{33}{44}=\frac{3}{4}, \frac{75}{100}=\frac{3}{4}$

Therefore, 33: 44 = 75: 100

Hence, these are in proportion.

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Question 2:

Write True (T) or False (F) against each of the following statements:

(a) 16:24::20:30 (b) 21:6::35:10

(c) 12:18::28:12 (d) 8:9::24:27

(e) 5.2:3.9::3:4 (f) 0.9:0.36::10:4

ANSWER:

(a) 16: 24:: 20: 30

$\frac{16}{24}=\frac{2}{3}, \frac{20}{30}=\frac{2}{3}$

Therefore, 16: 24 = 20: 30

Hence, True

(b) 21: 6:: 35: 10

$\frac{21}{6}=\frac{7}{2}, \frac{35}{10}=\frac{7}{2}$

Therefore, 21: 6 = 35: 10

Hence, True

(c) 12: 18:: 28: 12

$\frac{12}{18}=\frac{2}{3}, \frac{28}{12}=\frac{7}{3}$

Therefore, 12: 18 ≠ 28: 12

Hence, False

(d) 8: 9:: 24: 27

As $\frac{24}{27}=\frac{3\times 8}{3\times 9}=\frac{8}{9}$,

Therefore, True

(e) 5.2: 3.9:: 3: 4

As $\frac{5.2}{3.9}=\frac{4}{3}$,

Therefore, 5.2: 3.9 ≠ 3: 4

Hence, False

(f) 0.9: 0.36:: 10: 4

$\frac{0.9}{0.36}=\frac{90}{36}=\frac{10}{4}$

Therefore, 0.9: 0.36 = 10: 4

Hence, True

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Question 3:

Are the following statements true?

(a) 40 persons: 200 persons = Rs 15: Rs 75

(b) 7.5 litres: 15 litres = 5 kg: 10 kg

(c) 99 kg: 45 kg = Rs 44: Rs 20

(d) 32 m: 64 m = 6 sec: 12 sec

(e) 45 km: 60 km = 12 hours: 15 hours

ANSWER:

(a) 40 persons: 200 persons = Rs 15: Rs 75

$$\frac{40}{200}=\frac{1}{5},\ \frac{15}{75}=\frac{1}{5}$$

True

(b) 7.5 *l*: 15 *l* = 5 kg: 10 kg

$$\frac{7.5}{15}=\frac{1}{2},\ \frac{5}{10}=\frac{1}{2}$$

True

(c) 99 kg: 45 kg = Rs 44: Rs 20

$$\frac{99}{45}=\frac{11}{5},\ \frac{44}{20}=\frac{11}{5}$$

True

(d) 32 m: 64 m = 6 sec: 12 sec

$$\frac{32}{64}=\frac{1}{2},\ \frac{6}{12}=\frac{1}{2}$$

True

(e) 45 km: 60 km = 12 hrs: 15 hrs

$\frac{45}{60}=\frac{3}{4}, \frac{12}{15}=\frac{4}{5}$

False

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Question 4:

Determine if the following ratios form a proportion. Also, write the middle terms and extreme terms where the ratios form a proportion.

(a) 25 cm: 1 m and Rs 40 : Rs 160

(b) 39 litres: 65 litres and 6 bottles: 10 bottles

(c) 2 kg: 80 kg and 25 g: 625 g

(d) 200 mL: 2.5 litre and Rs 4: Rs 50

ANSWER:

(a) 25cm: 1 m and Rs 40: Rs 160

25 cm = $\frac{25}{100}$ m = 0.25 m

$\frac{0.25}{1}=\frac{1}{4}$ and $\frac{40}{160}=\frac{1}{4}$

Yes. These are in proportion.

Middle terms are 1m, Rs 40.

Extreme terms are 25 cm, Rs 160.

(b) 39 *l*: 65 *l* and 6 bottles: 10 bottles

$\frac{39}{65}=\frac{3}{5}$ and $\frac{6}{10}=\frac{3}{5}$

Yes. These are in proportion.

Middle terms are 65 *l*, 6 bottles.

Extreme terms are 39 *l*, 10 bottles.

(c) 2 kg: 80 kg and 25g: 625 g

$\frac{2}{80}=\frac{1}{40}$ and $\frac{25}{625}=\frac{1}{25}$

No. These are not in proportion.

(d) 200 mL: 2.5 *l* and Rs 4: Rs 50

1 *l* = 1000 mL

2.5 *l* = 2500 mL

$\frac{200}{2500}=\frac{2}{25}$ and $\frac{4}{50}=\frac{2}{25}$

Yes. These are in proportion.

Middle terms are 2.5 *l*, Rs 4.

Extreme terms are 200 mL, Rs 50.

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Question 1:

If the cost of 7 m of cloth is Rs 1470, find the cost of 5 m of cloth.

ANSWER:

Cost of 7 m cloth = Rs 1470

Cost of 1 m cloth = $\frac{1470}{7}$= Rs 210 14707= Rs 210

Therefore, cost of 5 m cloth = 210 × 5 = Rs 1050

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Question 2:

Ekta earns Rs 3000 in 10 days. How much will she earn in 30 days?

ANSWER:

Money earned in 10 days = Rs 3000

Money earned in 1 day = $\frac{3000}{10}$300010 = Rs 300

Therefore, money earned in 30 days = 300 × 30 = Rs 9000

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Question 3:

If it has rained 276 mm in the last 3 days, how many cm of rain will fall in one full week (7 days)? Assume that the rain continues to fall at the same rate.

ANSWER:

Measure of rain in 3 days = 276 mm

Measure of rain in 1 day = $\frac{276}{3} = 92$ mm

Therefore, measure of rain in 7 days = 92 × 7 = 644 mm

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Question 4:

Cost of 5 kg of wheat is Rs 91.50.

(a) What will be the cost of 8 kg of wheat?

(b) What quantity of wheat can be purchased in Rs 183?

ANSWER:

(a) Cost of 5 kg wheat = Rs 91.50

Cost of 1 kg wheat = $91.505 = Rs\ 18.30$91.505=Rs 18.30

Therefore, cost of 8 kg wheat = 18.30 × 8 = Rs 146.40

(b) Wheat purchased in Rs 91.50 = 5 kg

Wheat purchased in Re 1 = $591.50$591.50kg

Therefore, wheat purchased in Rs 183 = $591.50 \times 183$591.50×183 = 10 kg

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Question 5:

The temperature dropped 15 degree Celsius in the last 30 days. If the rate of temperature drop remains the same, how many degrees will the temperature drop in the next ten days?

ANSWER:

Temperature drop in 30 days = 15°C

Temperature drop in 1 day = $\frac{15}{30} = \left(\frac{1}{2}\right)°C$

Therefore, temperature drop in next 10 days = $\frac{1}{2} \times 10 = 5°C$

Thus, there will be a temperature drop of 5ºC in the next ten days.

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Question 6:

Shaina pays Rs 15000 as rent for 3 months. How much does she has to pay for a whole year, if the rent per month remains same?

ANSWER:

Rent for 3 months = Rs 15000

Rent for 1 month = $150003$150003 = Rs 5000

Therefore, rent for 12 months = 5000 × 12 = 60000

Thus, she has to pay Rs 60000 for a whole year.

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Question 7:

Cost of 4 dozens bananas is Rs 180. How many bananas can be purchased for Rs 90?

ANSWER:

Numbers of bananas bought in Rs 180 = 4 dozens = 4 × 12 = 48

Number of bananas bought in Re 1 =$48180$48180

Therefore, number of bananas bought in Rs 90 = $48180 \times 90$48180×90 = 24 bananas

Thus, 24 bananas can be purchased for Rs 90.

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Question 8:

The weight of 72 books is 9 kg. What is the weight of 40 such books?

ANSWER:

Weight of 72 books = 9 kg

Weight of 1 book = $\frac{9}{72} = \frac{1}{8}\text{kg}$

Therefore, weight of 40 books = $\frac{1}{8} \times 40 = 5 \text{ kg}$

Thus, the weight of 40 such books is 5 kg.

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Question 9:

A truck requires 108 litres of diesel for covering a distance of 594 km. How much diesel will be required by the truck to cover a distance of 1650 km?

ANSWER:

Diesel required for 594 km = 108 litres

Diesel required for 1 km = $\frac{108}{594} = \frac{2}{11}\text{litre}$

Therefore, diesel required for 1650 km = $\frac{2}{11} \times 1650$ = 300 litres

Thus, 300 litres diesel will be required by the truck to cover a distance of 1650 km.

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Question 10:

Raju purchases 10 pens for Rs 150 and Manish buys 7 pens for Rs 84. Can you say who got the pens cheaper?

ANSWER:

Raju purchased 10 pens for Rs 150.

∴ Price of 1 pen = $\frac{150}{10} = \text{Rs } 15$

Manish purchased 7 pens for Rs 84.

∴ Price of 1 pen = $\frac{84}{7} = \text{Rs } 12$

Therefore, Manish got the pens cheaper.

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Question 11:

Anish made 42 runs in 6 overs and Anup made 63 runs in 7 overs. Who made more runs per over?

ANSWER:

Runs made by Anish in 6 overs = 42

∴ Runs made by Anish in 1 over = $\frac{42}{6} = 7$

Runs made by Anup in 7 overs = 63

∴ Runs made by Anup in 1 over = $\frac{63}{7}$ = 9

Clearly, Anup made more runs per over.