Ratios

Inverse Ratios

I am practising solving inverse ratio problems.

Ref: Book 8 Pg. 43

Exercise 1

For each of the problems below work out how long it would take one person to do the job.

Eg: Frank and Freda have planned to spend three days painting the toilet block at school. How long will it take if just one of them was to paint the toilet block by themselves?
Answer: Frank and Freda would have spent 2 lots of 3 days painting, which would be six days altogether. So one person would take six days.

1) Abe, Betty and Carl plan to dig over the school gardens. They plan to spend 10 days doing this. How long will it take if just one of them was to dig over the gardens?

2) Five friends have planned to spend six days redecorating their student flat. How long will it take if just one of them was to redecorate the flat?

3) Twenty Year 9 students take 15 minutes to clean up the school grounds. How long would it take for just one student to clean up the school grounds?

4) Four friends ring around to invite people to a party. It takes them 30 minutes each to do this. How long would it have taken if one person were to have done all the ringing around?

5) It took six students 5 minutes to pack away the sports equipment at the end of class. How long would it have taken one student to do the same job?

6) At the sausage sizzle they used 3 barbeques to cook all of the sausages and it took 20 minutes How long would it have taken if they only had one barbeque?

7) It took five students 12 minutes to do all the dishes at camp. How long would it have taken one student to do the dishes?

8) At the end of the surf carnival it took ten people 45 minutes to clean up the surf club and surrounds. How long would it have taken one person working on their own to clean up the surf club and surrounds?

Exercise 2

For each problem below you need to work out all the different ways of allocating people and time to do the job. For each problem you need to assume that people only do whole hours of work and all the people work for the same length of time.

Eg Mr McCaw has allocated 16 hours to prepare the rugby field for the 1st XV game next Saturday. How many different ways can the people and time be allocated to do this job?
Answer: 1 person doing 16 hours, 2 people doing 8 hours each, four people doing 4 hours each. 8 people doing 2 hours each, 16 people doing 1 hour each.

1) Ms Ohara knows that it will take 36 hours to sew all the costumes for the school production. How many different ways could the people and time be allocated to sew the costumes?
2) Mr Butler has allocated 60 hours to make the set and props for the school production. How many different ways could the people and time be allocated to make the set and props?
3) Ms Wilson has to get the netball courts prepared for the upcoming secondary schools tournament. She knows that this will take 20 hours. How many different ways could the people and time be allocated to prepare the courts?
4) Mr Casio arranged the engraving of all the school calculators and computers. This was a job he was not looking forward to as it was going to take 100 hours. How many different ways could the people and time be allocated to do the engraving?
5) Ms Cathcart has 235 olive trees to pick. She knows that this task will take 72 hours. How many different ways could the people and time be allocated to pick the olives?

Exercise 3

For each problem below you need to find all the other ways of allocating people and time to do the job. Assume that people work whole days.

Eg: Mr Dulux allocates 8 painters for 6 days to a painting job. Find all the other ways he could allocate the painters and the days.
Answer: Total number of painting days is 8×6 which is 48 days. So other combinations are: 1 person for 48 days, 2 people for 24 days, 3 people for 16 days 4 people for 12 days, 6 people for 8 days, 12 people for 4 days, 16 people for 3 days, 24 people for 2 days and 48 people for 1 day.

1) Mr British allocates 8 painters for 12 days to do a painting job. Find all the other ways he could allocate the painters and the days.
2) Mr Resene allocates 7 painters for 10 days to do a painting job. Find all the other ways he could allocate the painters and the days.
3) Mr Guthrie allocates 5 painters for 8 days to do a painting job. Find all the other ways he could allocate the painters and the days.
4) Mr Mitre allocates 11 painters for 8 days to do a painting job. Find all the other ways he could allocate the painters and the days.

5)   Mr Bunnings allocates 5 painters for 15 days to do a painting job. Find all the other ways he could allocate the painters and the days.

Exercise 4

For each problem below you need to find how long it would take to do the same job with a different number of people.

Eg: If it takes four people 15 days to do a particular job, how long would it take three people to do the same job.
Answer: One person would take 60 days altogether to do the job; so three people would take 20 days each to do the job.

1)   If it takes ten people nine days to do a particular job, how long would it take 15 people to do the same job?
2)   If it takes four people 24 days to do a particular job, how long would it take three people to do the same job?
3)   If it takes ten people ten days to do a particular job, how long would it take 25 people to do the same job?
4)   If it takes 18 people two days to do a particular job, how long would it take six people to do the same job?
5)   If it takes seven people eight days to do a particular job, how long would it take four people to do the same job?
6)   If it takes 16 people three days to do a particular job, how long would it take 12 people to do the same job?

Exercise 5

For each problem below you need to find how many people it would take to do the same job in a different amount of time.

Eg: If it takes four people 15 days to do a particular job, how many people would you need to do the job in 10 days.
Answer: Four people would take 60 days altogether to do the job; so to do the job in 10 days you would need 6 people.

1)   If it takes eight people nine hours to do a particular job, how many people would you need to do the job in six hours?
2)   If it takes nine people ten hours to do a particular job, how many people would you need to do the job in 15 hours?
3)   If it takes six people 20 hours to do a particular job, how many people would you need to do the job in 15 hours?
4)   If it takes five people 36 hours to do a particular job, how many people would you need to do the job in 20 hours?
5)   If it takes nine people eight hours to do a particular job, how many people would you need to do the job in three hours?
6)   If it takes six people 15 hours to do a particular job, how many people would you need to do the job in 18 hours?

Exercise 6

For each of the problems below work out how much one person does in one day, one hour or one minute depending on the situation.

Eg: Three friends paint 231 bicycles in seven days. How many bicycles does one friend paint in one day?
Answer: It takes 21 "friend-days" of work to paint 231 bicycles. One "friend-day" produces 11 painted bicycles.

1)   Four friends fold 144 paper cranes in three hours. How many paper cranes does one friend make in an hour?
2)   The six people who work in the tuck shop pack 300 healthy sandwiches in 25 minutes. How many healthy sandwiches does one person pack in one minute?
3)   Three helpful students put 465 newsletters into envelopes in 31 minutes. How many newsletters does one person put into envelopes in one minute?
4)   Six people take three days to make 756 items. How many items does one person make in one day?
5)   Four people paint 288 flowerpots in six hours. How many flowerpots does one person paint in one hour?
6)   In five days seven people build 455 toy planes. How many toy planes does one person build in one day?
7)   Eleven people take three days to make up 264 kitset chairs. How many kitset chairs does one person make up in one day?
8)   In seven hours eight people made 784 items. How many items does one person make in one hour?

Exercise 7

For each of the problems below work out how much one person does in one day, one hour or one minute depending on the situation and use this information to help you work out how many a given number of people could do in a day.

Eg: Three friends paint 231 bicycles in seven days. How many bicycles do five friends paint in one day?
Answer: It takes 21 "friend-days" of work to paint 231 bicycles. One "friend-day" produces 11 painted bicycles; so five friends would paint 55 bicycles in a day.

1)   Four friends fold 144 paper cranes in three hours. How many paper cranes do three friends make in an hour?
2)   The six people who work in the tuck shop pack 300 healthy sandwiches in 25 minutes. How many healthy sandwiches do eight people pack in one minute?
3)   Three helpful students put 465 newsletters into envelopes in 31 minutes. How many newsletters do five people put into envelopes in one minute?

4)   Six people take three days to make 756 items. How many items do five people make in one day?

5)   Four people paint 288 flowerpots in six hours. How many flowerpots do seven people paint in one hour?

6)   In five days seven people build 455 toy planes. How many toy planes do three people build in one day?

7)   Eleven people take three days to make up 264 kitset chairs. How many kitset chairs do eight people make up in one day?

8)   In seven hours eight people made 784 items. How many items do six people make in one hour?

Exercise 8

For each of the problems below work out how much one person does in one day, one hour or one minute depending on the situation and use this information to help you work out how many a given number of people could do in a day.

Eg: Five friends paint 420 bicycles in seven days. How many bicycles do six friends paint in one day?
Answer: It takes 35 "friend-days" of work to paint 420 bicycles. One "friend-day" produces 12 painted bicycles; so six friends would paint 72 bicycles in a day.

1)   Three friends fold 396 paper cranes in 12 hours. How many paper cranes do five friends make in an hour?

2)   The seven people who work in the tuck shop pack 630 healthy sandwiches in 30 minutes. How many healthy sandwiches do six people pack in one minute?

3)   Four helpful students put 980 newsletters into envelopes in 35 minutes. How many newsletters do seven people put into envelopes in one minute?

4)   Nine people take five days to make 1575 items. How many items do five people make in one day?

5)   Six people paint 216 flowerpots in four hours. How many flowerpots do seven people paint in one hour?

6)   In two days eight people build 240 toy planes. How many toy planes do three people build in one day?

7)   Five people take six days to make up 180 kitset chairs. How many kitset chairs do eleven people make up in one day?

8)   In eight hours six people 816 items. How many items do nine people make in one hour?

Exercise 9

For each of the problems below work out how much one person does in one day, one hour or one minute depending on the situation, how many a given number of people could do in a day and use this information to find how long it takes the given number of people to complete the task.

Eg: Five friends paint 420 bicycles in seven days. How long does it take six friends to paint 288 bicycles?

Answer: It takes 35 "friend-days" of work to paint 420 bicycles. One "friend-day" produces 12 painted bicycles; so six friends would paint 72 bicycles in a day. They need to paint 288 bicycles so this means that it would take the six friends four days to paint the 288 bicycles.

1) Three friends fold 396 paper cranes in 12 hours. How long will it take five friends to make 385 paper cranes?
2) The seven people who work in the tuck shop pack 630 healthy sandwiches in 30 minutes. How long will it take six people to pack 396 healthy sandwiches?
3) Four helpful students put 980 newsletters into envelopes in 35 minutes. How long will it take seven people to put the 980 newsletters into envelopes?
4) Nine people take five days to make 1575 items. How long will it take five people to make 700 items?
5) Six people paint 216 flowerpots in four hours. How long will it take seven people to paint 315 flowerpots?
6) In two days eight people build 240 toy planes. How long will it take three people to build 315 toy planes?
7) Five people take six days to make up 180 kitset chairs. How long will it take eleven people to make up 990 kitset chairs?
8) In eight hours six people 816 items. How long will it take nine people to make 1530 items?

Exercise 10

Solve the problems below.

A. Set your working out clearly explaining what you are working out at each step.

Eg: Five friends paint 420 bicycles in seven days. How long does it take six friends to paint 288 bicycles?

Answer:

$5 \times 7 = 35$ "friend-days" to paint 420 bicycles.

$420 \div 35 = 12$ painted bicycles per friend day

$6 \times 12 = 72$ bicycles in a day for six friends

$288 \div 72 = 4$ days for six friends to paint 288 bicycles

B. For each problem rewrite your solution starting at the bottom and replace calculated values with the calculation at the next step back. This should lead to an expression that will calculate the answer in one go.

$288 \div 72$	$(288 \div 72 = 4)$
$= 288 \div (6 \times 12)$	$(6 \times 12 = 72)$
$= 288 \div (6 \times (420 \div 35))$	$(420 \div 35 = 12)$
$= 288 \div (6 \times (420 \div (5 \times 7)))$	$(5 \times 7 = 35)$
$= (288 \times 5 \times 7) \div (6 \times 420)$	(knowing that $a \div (b \div c)$ is the same as $a \times c \div b$)

1) Four friends fold 144 paper cranes in three hours. How long does it take three friends to make 180 paper cranes?
2) Four people paint 288 flowerpots in six hours. How long does it take seven people to paint 840 flowerpots?
3) In five days seven people build 455 toy planes. How does it take three people to build 312 toy planes?

Ratios
Ratios: Inverse ratios
Answers

Exercise 1
1)   30 days   (2)   30 days   (3)   300mins (5hrs)   (4)   120mins (2 hrs)   (5)   30mins
6)   60mins   (7)   60mins   (8)   450 mins

Exercise 2

1) 1 person 36 hrs   2 person 18 hrs   3 person 12 hrs   4 person 9 hrs   6 person 6 hrs   9 person 4 hrs   12 person 3 hrs   18 people 2hrs   36 people 1 hr

(2)

people	1	2	3	5	10	20	30	60
hours	60	30	20	12	6	3	2	1

(3)

people	1	2	5	10	20
hours	20	10	4	2	1

(4)

people	1	2	4	5	10	20	50	100
hours	100	50	25	20	10	5	2	1

(5)

people	1	2	3	4	6	8	9	12	18	24	36
hours	72	36	24	18	12	9	8	6	4	3	2

Exercise 3
(1)

people	1	2	3	4	6	12	16	24	32	48	96
days	96	48	32	24	16	8	6	4	3	2	1

(2)

days	1	2	5	10	14	35	70
painters	70	35	14	7	5	2	1

(3)

days	1	2	4	8	10	20	40
painters	40	20	10	5	4	2	1

(4)

days	1	2	4	8	22	44	88
painters	88	44	22	11	4	2	1

(5)

days	1	3	5	15	25	75
painters	75	25	15	5	3	1

Exercise 4

1) 6 days   (2)   32 days   (3) 4 days   (4)   6 days
(5) 14 days   (6)   4 days

Exercise 5

1)   12 people   (2)   6 people   (3) 8 people   (4)   9 people
(5)   24 people   6)   5 people

Exercise 6

1)   12 cranes   (2)   2 sandwiches (3) 5 newsletters   (4) 42 items   (5)   12
flower pots   6)   39 toy planes (7) 8 kitset chairs   (8) 14 items

Exercise 7

1)36 cranes   (2) 12 sandwiches   (3) 25 newsletters   (4) 210 items   (5) 84 flower
pots   6) 39 toy planes   (7) 64 kitset chairs (8) 84 items

Exercise 8

1)55 cranes   (2) 18 sandwiches   (3) 98 newsletters   (4) 175 items   (5) 63 flower
pots   6) 45 toy planes   (7) 66 kitset chairs (8) 153 items

Exercise 9

1) 7h   (2) 22min   (3)10 min   (4)   4 days   (5) 5 hours
6) 7 days   (7) 15 days   (8) 10 hours

Exercise 10

1)   A   4 friends 1444 cranes   3 hours
                12 friend hours for 144 cranes
                12 cranes per friend hour
                3 x 12 = 36 cranes for 3 friends
                180 ÷ 36 = 5 hours for 180 cranes   3 friends to make.

          B   180 ÷ 36
                180 ÷ (3 x 12)

180 ÷ (3 x (144÷(4x3))

(180 x 4 x 3) ÷ (3 x 144)

2) A   4 people 288 pots 6 hours

24 people for 288 pots

12 pots per person per hour

7 x 12 = 84 pots for 7 people

840 ÷ 84 = 10 hours for 840 pots with 7 people.

B   840 ÷ 84

= 840 ÷ (7 x 12)

= 840 ÷ (7 x (288 ÷(4 x 6)))

= 840 x 4 x 6 ÷ (7 x 288)

3) A   5 days 7 people 455 planes

35 people days for 455 planes

455 ÷ 35 = 13 planes per person day

3 x 13 = 39 planes for 3 people

312 ÷ 39 = 24 days for 3 people to make 312 planes

B   312 ÷ 39=

312 ÷ (3 x 13)

312 ÷ (3 x (455 ÷ 35))

312 ÷ (3 x (455 ÷ (5x7)))

312 x 5 x 7 ÷ (3 x 455)