Unit Three
Division

Topic A: Introduction and Division Facts

Division is an interesting operation. Both these signs tell you to divide:

$\div$ $\overline{)}$

Division is the opposite of multiplication.

- Multiplication takes equal-sized groups and puts the groups together to find the total.

  ○○○○ ○○○○ ○○○○ $3 \times 4 = 12$

- **Division** takes the total and **separates** that amount into equal groups. You can find the number of equal groups or the size of each group.

  ○○○○○○○○○○○○ = ○○○○ ○○○○ ○○○○ $12 \div 4 = 3$

$4 \times 3 = 12$ $12 \div 3 = 4$ $3\overline{)12}$ (quotient: 4)

$3 \times 4 = 12$ $12 \div 4 = 3$ $4\overline{)12}$ (quotient: 3)

Learn this vocabulary for division:

Dividend – The number or quantity to be divided; the amount altogether.

Divisor – The number we divide by. The divisor tells us the number of groups or the quantity in each group that the dividend is to be separated into.

Quotient – ("kw o̅ shent") The answer to a division question.

$$\begin{array}{r} quotient \\ divisor\overline{)dividend} \end{array}$$

dividend $\div$ *divisor = quotient*

If you have learned your times tables well, the division facts will be easier. The times table chart can be used to find division facts.

To use the times table chart for division facts:

- Find the divisor in the column on the left of the times table chart.
- Run your finger in a straight line across the divisor row until you come to the dividend.
- Go straight up that column and the quotient should be the top number.

Try a few while you are doing Exercise One.

Exercise One

Complete this chart to help yourself understand the connection between multiplication and division. The first one is done for you. Check your work using the answer key at the end of the exercise.

	Multiplication	**Division**	**Division**	**"Say"**
a)	$5 \times 3 = 15$ $3 \times 5 = 15$	$15 \div 3 = 5$ $15 \div 5 = 3$	$3\overline{)15}$ 5 $5\overline{)15}$ 3	*15 divided by 3 is 5* *15 divided by 5 is 3*
b)	$8 \times 6 = 48$ $6 \times 8 = 48$	$48 \div 6 = 8$ $48 \div 8 = 6$	$6\overline{)48}$ $8\overline{)48}$	*48 divided by 6 is 8*
c)	$3 \times 7 = 21$			
d)	$5 \times 9 = 45$			

	Multiplication	Division	Division	"Say"
e)	$4 \times 6 = 24$			
f)	$2 \times 8 = 16$			
g)	$7 \times 10 = 70$			
h)	$6 \times 9 = 54$			
i)	$9 \times 4 = 36$			
j)	$6 \times 7 = 42$			
k)	$7 \times 9 = 63$			

Answers to Exercise One

	Multiplication	Division	Division	"Say"
a)	*5 × 3 = 15* *3 × 5 = 15*	*15 ÷ 3 = 5* *15 ÷ 5 = 3*	$3\overline{)15}\ 5$ $5\overline{)15}\ 3$	*15 divided by 3 is 5* *15 divided by 5 is 3*
b)	8 × 6 = 48 6 × 8 = 48	*48 ÷ 6 = 8* *48 ÷ 8 = 6*	$6\overline{)48}\ 8$ $8\overline{)48}\ 6$	*48 divided by 6 is 8* *48 divided by 8 is 6*
c)	3 × 7 = 21 7 × 3 = 21	21 ÷7 = 3 21 ÷ 3 = 7	$7\overline{)21}\ 3$ $3\overline{)21}\ 7$	21 divided by 7 is 3 21 divided by 3 is 7
d)	5 × 9 = 45 9 × 5 = 45	45 ÷ 9 = 5 45 ÷ 5 = 9	$9\overline{)45}\ 5$ $5\overline{)45}\ 9$	45 divided by 9 is 5 45 divided by 5 is 9
e)	4 × 6 = 24 6 × 4 = 24	24 ÷ 6 = 4 24 ÷ 4 = 6	$6\overline{)24}\ 4$ $4\overline{)24}\ 6$	24 divided by 6 is 4 24 divided by 4 is 6
f)	2 × 8 = 16 8 × 2 = 16	16 ÷ 8 = 2 16 ÷ 2 = 8	$8\overline{)16}\ 2$ $2\overline{)16}\ 8$	16 divided by 8 is 2 16 divided by 2 is 8
g)	7 × 10 = 70 10 × 7 = 70	70 ÷ 10 = 7 70 ÷ 7 = 10	$10\overline{)70}\ 7$ $7\overline{)70}\ 10$	70 divided by 10 is 7 70 divided by 7 is 10
h)	6 × 9 = 54 9 × 6 = 54	54 ÷ 9 = 6 54 ÷ 6 = 9	$9\overline{)54}\ 6$ $6\overline{)54}\ 9$	54 divided by 9 is 6 54 divided by 6 is 9
i)	9 × 4 = 36 4 × 9 = 36	36 ÷ 4 = 9 36 ÷ 9 = 4	$4\overline{)36}\ 9$ $9\overline{)36}\ 4$	36 divided by 4 is 9 36 divided by 9 is 4
j)	6 × 7 = 42 7 × 6 = 42	42 ÷ 7 = 6 42 ÷ 6 = 7	$7\overline{)42}\ 6$ $6\overline{)42}\ 7$	42 divided by 7 is 6 42 divided by 6 is 7

	Multiplication	Division	Division	"Say"
k)	$7 \times 9 = 63$ $9 \times 7 = 63$	$63 \div 9 = 7$ $62 \div 7 = 9$	$9\overline{)63}$ 7 $7\overline{)63}$ 9	63 divided by 9 is 7 63 divided by 7 is 9

Exercise Two

Complete this chart to help yourself understand the connection between multiplication and division. Check your work using the answer key at the end of the exercise.

	Multiplication	Division	Division	"Say"
a)	$8 \times 4 = 32$			
b)	$5 \times 10 = 50$			
c)	$2 \times 3 = 6$			
d)	$5 \times 8 = 40$			

	Multiplication	Division	Division	"Say"
e)	$3 \times 4 = 12$			
f)	$2 \times 10 = 20$			
g)	$9 \times 8 = 72$			
h)	$6 \times 5 = 30$			
i)	$7 \times 4 = 28$			
j)	$10 \times 3 = 30$			
k)	$5 \times 5 = 25$			

Answers to Exercise Two

	Multiplication	Division	Division	"Say"
a)	8 x 4 = 32 4 x 8 = 32	32 ÷ 4 = 8 32 ÷ 8 = 4	$4\overline{)32}^{\,8}$ $8\overline{)32}^{\,4}$	32 divided by 4 is 8 32 divided by 8 is 4
b)	5 × 10 = 50 10 x 5 = 50	50 ÷ 10 = 5 50 ÷ 5 = 10	$10\overline{)50}^{\,5}$ $5\overline{)50}^{\,10}$	50 divided by 10 is 5 50 divided by 5 is 10
c)	2 × 3 = 6 3 x 2 = 6	6 ÷ 3 = 2 6 ÷ 2 = 3	$3\overline{)6}^{\,2}$ $2\overline{)6}^{\,3}$	6 divided by 3 is 2 6 divided by 2 is 3
d)	5 × 8 = 40 8 x 5 = 40	40 ÷ 8 = 5 40 ÷ 5 = 8	$8\overline{)40}^{\,5}$ $5\overline{)40}^{\,8}$	40 divided by 8 is 5 40 divided by 5 is 8
e)	3 × 4 = 12 4 x 3 = 12	12 ÷ 4 = 3 12 ÷ 3 = 4	$4\overline{)12}^{\,3}$ $3\overline{)12}^{\,4}$	12 divided by 4 is 3 12 divided by 3 is 4
f)	2 × 10 = 20 10 x 2 = 20	20 ÷ 10 = 2 20 ÷ 2 = 10	$10\overline{)20}^{\,2}$ $2\overline{)20}^{\,10}$	20 divided by 10 is 2 20 divided by 2 is 10
g)	9 × 8 = 72 8 x 9 = 72	72 ÷ 8 = 9 72 ÷ 9 = 8	$8\overline{)72}^{\,9}$ $9\overline{)72}^{\,8}$	72 divided by 8 is 9 72 divided by 9 is 8
h)	6 × 5 = 30 5 x 6 = 30	30 ÷ 5 = 6 40 ÷ 6 = 5	$5\overline{)30}^{\,6}$ $6\overline{)30}^{\,5}$	30 divided by 5 is 6 30 divided by 6 is 5
i)	7 × 4 = 28 4 x 7 = 28	28 ÷ 4 = 7 28 ÷ 7 = 4	$4\overline{)28}^{\,7}$ $7\overline{)28}^{\,4}$	28 divided by 4 is 7 28 divided by 7 is 4

	Multiplication	Division	Division	"Say"
j)	$10 \times 3 = 30$ $3 \text{ x } 10 = 30$	$30 \div 3 = 10$ $30 \div 10 = 3$	$3\overline{)30}^{10}$ $10\overline{)30}^{3}$	30 divided by 3 is 10 30 divided by 10 is 3
k)	$5 \times 5 = 25$ $5 \text{ x } 5 = 25$	$25 \div 5 = 5$ $25 \div 5 = 5$	$5\overline{)25}^{5}$ $5\overline{)25}^{5}$	25 divided by 5 is 5 25 divided by 5 is 5

Exercise Three

Check your division facts by **quickly** doing this exercise.
Check your work using the answer key at the end of the exercise.

a) $72 \div 6 =$ _____ b) $12 \div 2 =$ _____ c) $3 \div 1 =$ _____

d) $80 \div 10 =$ _____ e) $18 \div 6 =$ _____ f) $40 \div 4 =$ _____

g) $21 \div 7 =$ _____ h) $50 \div 5 =$ _____ i) $54 \div 9 =$ _____

j) $8 \div 2 =$ _____ k) $22 \div 11 =$ _____ l) $45 \div 9 =$ _____

m) $4 \div 4 =$ _____ n) $24 \div 6 =$ _____ o) $81 \div 9 =$ _____

p) $88 \div 8 =$ _____ q) $30 \div 3 =$ _____ r) $12 \div 4 =$ _____

s) $33 \div 3 =$ _____ t) $66 \div 11 =$ _____ u) $20 \div 5 =$ _____

v) $6 \div 2 =$ _____ w) $30 \div 6 =$ _____ x) $24 \div 12 =$ _____

Answers to Exercise Three

a) 12	b) 6	c) 3	d) 8	e) 3	f) 10	g) 3
h) 10	i) 6	j) 4	k) 2	l) 5	m) 1	n) 4
o) 9	p) 11	q) 10	r) 3	s) 11	t) 6	u) 4
v) 3	w) 5	x) 2				

Exercise Four

Check your division facts by **quickly** doing this exercise.
Check your work using the answer key at the end of the exercise.

a) $1\overline{)2}$ b) $10\overline{)100}$ c) $9\overline{)18}$

d) $5\overline{)5}$ e) $1\overline{)1}$ f) $4\overline{)44}$

g) $7\overline{)63}$ h) $5\overline{)35}$ i) $7\overline{)42}$

j) $12\overline{)96}$ k) $3\overline{)15}$ l) $10\overline{)10}$

m) $11\overline{)77}$ n) $8\overline{)16}$ o) $3\overline{)27}$

p) $1\overline{)8}$ q) $9\overline{)9}$ r) $2\overline{)14}$

s) $8\overline{)56}$ t) $10\overline{)60}$ u) $1\overline{)7}$

v) $9\overline{)108}$ w) $8\overline{)40}$ x) $11\overline{)11}$

Answers to Exercise Four

a) 2	b) 10	c) 2	d) 1	e) 1	f) 11	g) 9
h) 7	i) 6	j) 8	k) 5	l) 1	m) 7	n) 2
o) 9	p) 8	q) 1	r) 7	s) 7	t) 6	u) 7
v) 12	w) 5	x) 1				

Exercise Five

Check your division facts by **quickly** doing this exercise.
Check your work using the answer key at the end of the exercise.

a) $90 \div 10 =$ _____ b) $70 \div 7 =$ _____ c) $28 \div 7 =$ _____

d) $32 \div 8 =$ _____ e) $24 \div 3 =$ _____ f) $36 \div 12 =$ _____

g) $84 \div 7 =$ _____ h) $10 \div 2 =$ _____ i) $64 \div 8 =$ _____

j) $6 \div 6 =$ _____ k) $60 \div 12 =$ _____ l) $48 \div 4 =$ _____

m) $72 \div 9 =$ _____ n) $20 \div 10 =$ _____ o) $49 \div 7 =$ _____

p) $48 \div 6 =$ _____ q) $36 \div 9 =$ _____ r) $21 \div 3 =$ _____

s) 32 ÷ 4 = _____ t) 60 ÷ 6 = _____ u) 40 ÷ 4 = _____

v) 48 ÷ 8 = _____ w) 77 ÷7 = _____ v) 55 ÷ 11 = _____

Answers to Exercise Five

a) 9	b) 10	c) 4	d) 4	e) 8	f) 3	g) 12
h) 5	i) 8	j) 1	k) 5	l) 12	m) 8	n) 2
o) 7	p) 8	q) 4	r) 7	s) 8	t) 10	u) 10
v) 6	w) 11	x) 5				

Exercise Six

Check your division facts by **quickly** doing this exercise.
Check your work using the answer key at the end of the exercise.

a) $5\overline{)40}$ b) $2\overline{)18}$ c) $12\overline{)108}$

d) $4\overline{)24}$ e) $11\overline{)110}$ f) $5\overline{)25}$

g) $12\overline{)84}$ h) $3\overline{)12}$ i) $5\overline{)45}$

j) $8\overline{)72}$ k) $6\overline{)54}$ l) $11\overline{)99}$

m) $5\overline{)60}$ n) $4\overline{)16}$ o) $3\overline{)36}$

p) $5\overline{)15}$ q) $4\overline{)36}$ r) $2\overline{)24}$

s) $12\overline{)132}$ t) $2\overline{)16}$ u) $3\overline{)9}$

v) $10\overline{)30}$ w) $11\overline{)121}$ x) $6\overline{)36}$

Answers to Exercise Six

a) 8	b) 9	c) 9	d) 6	e) 10	f) 5	g) 7
h) 4	i) 9	j) 9	k) 9	l) 9	m) 12	n) 4
o) 12	p) 3	q) 9	r) 12	s) 11	t) 8	u) 3
v) 3	w) 11	x) 6				

Exercise Seven

Check your division facts by **quickly** doing this exercise.
Check your work using the answer key at the end of the exercise.

a) $12 \div 6 =$ _____ b) $27 \div 9 =$ _____ c) $56 \div 7 =$ _____

d) $3 \div 1 =$ _____ e) $20 \div 2 =$ _____ f) $9 \div 3 =$ _____

g) $55 \div 5 =$ _____ h) $14 \div 7 =$ _____ i) $42 \div 6 =$ _____

j) $18 \div 3 =$ _____ k) $88 \div 11 =$ _____ l) $63 \div 9 =$ _____

m) $28 \div 4 =$ _____ n) $6 \div 1 =$ _____ o) $30 \div 5 =$ _____

p) $4 \div 2 =$ _____ q) $7 \div 7 =$ _____ r) $48 \div 12 =$ _____

s) 35 ÷ 7 = _____ t) 96 ÷ 8 = _____ u) 20 ÷ 4 = _____

v) 24 ÷ 8 = _____ w) 72 ÷12 = _____ x) 6 ÷ 3 = _____

Answers to Exercise Seven

a) 2	b) 3	c) 8	d) 3	e) 10	f) 3	g) 11
h) 2	i) 7	j) 6	k) 8	l) 7	m) 7	n) 6
o) 6	p) 2	q) 1	r) 4	s) 5	t) 12	u) 5
v) 3	w) 6	x) 2				

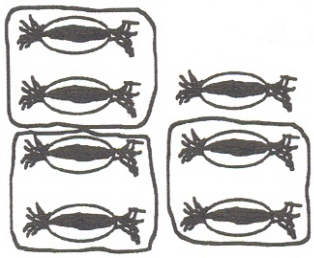
Make a list of any errors that you made and of the facts that you had to really think about. If you have any more than 5 facts on your list, ask your instructor for suggestions on learning and drilling the division facts.

Remainders

You have been practicing the division facts that always work out evenly – nothing is left over.

Well, in the real world things are not usually so perfect!

You have 7 candies to share among your 3 children.



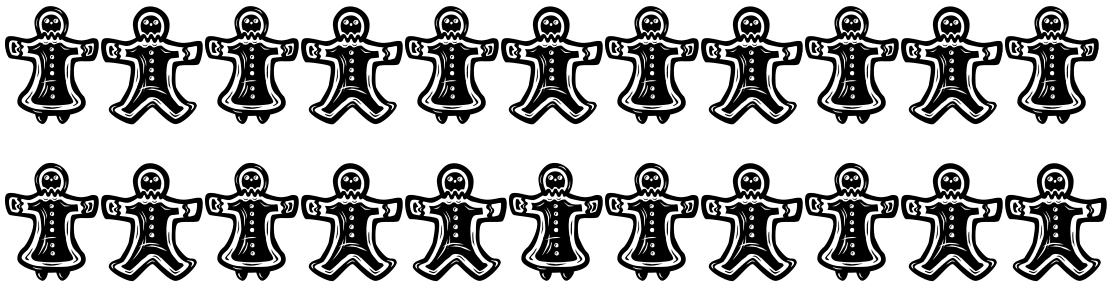
2 each and 1 candy left over

We call the left-over the **remainder**. For now, put **R** and the left over number after your quotient.

$7 \div 3 = 2 \text{ R } 1$ $\qquad$ $3\overline{)7}$ $\begin{matrix} 2 \\ \text{R } 1 \end{matrix}$

Here are 22 cookies. Circle groups of 5. How many groups of 5 in 22?

$22 \div 5 =$ _____



You should have 4 groups with 2 left over.

$22 \div 5 = 4 \text{ R } 2$ $\qquad$ $5\overline{)22}$ $\begin{matrix} 4 \\ \text{R } 2 \end{matrix}$

The remainder must not be the same size or bigger than the divisor. If it is bigger, it means another group could be made.

Here are 66 suns. Make groups of 9. How many groups? ____

☼ ☼
☼ ☼

☼ ☼

How many left over? _____

66 ÷ 9 = 7 R 3 $\qquad$ $9\overline{)66}$ $\begin{matrix}7\\ \text{R } 3\end{matrix}$

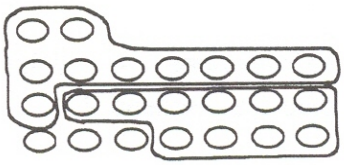
The remainder must **not** be the same size or bigger than the divisor. Why not? It would make another group.

Exercise Eight

Draw pictures to find the quotient and the remainder. Write each question using the other division sign as well. Have your instructor check your work.

a) 23 ÷ 10 = *2 R 3*

$10\overline{)23}$ $\begin{matrix}2\\ \text{R } 3\end{matrix}$



b) 24 ÷ 7 = _____

c) 19 ÷ 3 = _____

d) 39 ÷ 12 = _____

e) 14 ÷ 4 = _____

You cannot always draw pictures, so how should you find the quotients?

Example A: $29 \div 3 =$ _____

- Use multiplication tables or the division facts to find a **trial quotient**. What can you multiply by 3 to find a number close to 29?

  $3 \times 9 = 27$ ✓
  $3 \times 10 = 30$

  Use 9 as the **trial quotient**. Do not use 10 because $3 \times 10 = 30$ which is more than the dividend 29.

- **Divide** $3\overline{)29}$ → $\begin{array}{r} 9 \\ 3\overline{)29} \end{array}$

- **Multiply** $9 \times 3 = 27$ Write the product under the 29.

$$\begin{array}{r} 9 \\ 3\overline{)29} \\ \underline{27} \\ 2 \end{array}$$

- **Subtract** 27 from 29 to find the remainder.

- **Check (compare)** to be sure the remainder is less then (<) the divisor.

  $2 < 3$ ✓ $29 \div 3 = 9$ R 2

Example B: $60 \div 7 =$ _____ $7\overline{)60}$

- Think what can be multiplied by 7 to find a number close to 60.
  $7 \times 8 = 56$ ✓
  $7 \times 9 = 63$ too big

- **Divide** $\begin{array}{r} 8 \\ 7\overline{)60} \end{array}$

- **Multiply**

$$\begin{array}{r} 8 \\ 7\overline{)60} \\ \underline{56} \\ 4 \end{array}$$

- **Subtract** $60 - 56 = 4$

- **Compare** to be sure the remainder is less than the divisor.
  $4 < 7$ ✓ $60 \div 7 = 8$ R 4

Exercise Nine

Find the quotients and remainders (divide, multiply, subtract, compare.) Check your work using the answer key at the end of the exercise.

a) $5\overline{)28}$ b) $4\overline{)15}$ c) $6\overline{)47}$

d) $9\overline{)37}$ e) $2\overline{)13}$ f) $6\overline{)25}$

g) $8\overline{)75}$ h) $3\overline{)19}$ i) $7\overline{)32}$

j) $4\overline{)9}$ k) $9\overline{)55}$ l) $10\overline{)98}$

m) $3\overline{)26}$ n) $8\overline{)47}$ o) $9\overline{)46}$

p) $6\overline{)43}$ q) $5\overline{)49}$ r) $4\overline{)38}$

s) $2\overline{)19}$ t) $7\overline{)61}$ u) $3\overline{)23}$

v) $8\overline{)78}$ w) $9\overline{)67}$ x) $6\overline{)45}$

Answers to Exercise Nine

a) 5 R3	b) 3 R3	c) 7 R5	d) 4 R1	e) 6 R1	f) 4 R1	g) 9 R3
h) 6 R1	i) 4 R4	j) 2 R1	k) 6 R1	l) 9 R8	m) 8 R2	n) 5 R7
o) 5 R1	p) 7 R1	q) 9 R4	r) 9 R2	s) 9 R1	t) 8 R5	u) 7 R2
v) 9 R6	w) 7 R4	x) 7 R3				

Exercise Ten

Find the quotients and remainders (divide, multiply, subtract, compare.) Check your work using the answer key at the end of the exercise.

a) $5\overline{)44}$ b) $8\overline{)63}$ c) $9\overline{)80}$

d) $10\overline{)65}$ e) $3\overline{)22}$ f) $7\overline{)55}$

g) $4\overline{)39}$

h) $8\overline{)58}$

i) $6\overline{)41}$

j) $8\overline{)76}$

k) $5\overline{)47}$

l) $4\overline{)27}$

m) $6\overline{)53}$

n) $7\overline{)67}$

o) $9\overline{)78}$

p) $5\overline{)33}$

q) $9\overline{)64}$

r) $10\overline{)81}$

s) $2\overline{)19}$

t) $3\overline{)29}$

u) $6\overline{)51}$

v) $10\overline{)78}$

w) $7\overline{)68}$

x) $4\overline{)17}$

Answers to Exercise Ten

a) 8 R4	b) 7 R7	c) 8 R8	d) 6 R5	e) 7 R1	f) 7 R6	g) 9 R3
h) 7 R2	i) 6 R5	j) 9 R4	k) 9 R2	l) 6 R3	m) 8 R5	n) 9 R4
o) 8 R6	p) 6 R3	q) 7 R1	r) 8 R1	s) 9 R1	t) 9 R2	u) 8 R3
v) 7 R8	w) 9 R5	x) 4 R1				

Exercise Eleven

Find the quotients and remainders (divide, multiply, subtract, compare.) Check your work using the answer key at the end of the exercise.

Example: **59 ÷ 7 =**

Rewrite: $7\overline{)59}$

Then solve:

$$\begin{array}{r} 8 \\ 7\overline{)59} \\ 56 \\ \hline 3 \end{array}$$

Answer: 8 R3

a) 27 ÷ 5 =

b) 13 ÷ 2 =

c) 46 ÷ 9 =

d) 38 ÷ 6 =

e) 61 ÷ 7 =

f) 14 ÷ 5 =

g) 49 ÷ 8 =

h) 28 ÷ 3 =

i) 78 ÷ 8 =

j) 37 ÷ 4 =

k) 67 ÷ 9 =

l) 52 ÷ 6 =

m) 45 ÷ 8 =

n) 25 ÷ 7 =

o) 11 ÷ 3 =

p) 53 ÷ 9 =

q) 19 ÷ 4 =

r) 77 ÷ 8 =

s) $20 \div 3 =$

t) $11 \div 2 =$

u) $23 \div 5 =$

v) $54 \div 7 =$

w) $87 \div 9 =$

x) $9 \div 4 =$

Answers to Exercise Eleven

a) 5 R2	b) 6 R1	c) 5 R1	d) 6 R2	e) 8 R5	f) 2 R4	g) 6 R1
h) 9 R1	i) 9 R6	j) 9 R1	k) 7 R4	l) 8 R4	m) 5 R5	n) 3 R4
o) 3 R2	p) 5 R8	q) 4 R3	r) 9 R5	s) 6 R2	t) 5 R1	u) 4 R3
v) 7 R5	w) 9 R6	x) 2 R1				

Topic A: Self-Test

Mark /12 **Aim 9/12**

A. Give the answer. **6 marks**

a) $63 \div 9 =$ _____ b) $21 \div 7 =$ _____ c) $72 \div 8 =$ _____

d) $6\overline{)54}$ e) $8\overline{)64}$ f) $7\overline{)56}$

B. Find the quotient. **6 marks**

a) $6\overline{)59}$ b) $9\overline{)87}$ c) $7\overline{)51}$

d) $8\overline{)76}$ e) $5\overline{)49}$ f) $3\overline{)26}$

Answers to Topic A Self-Test

A.

a) 7 b) 3 c) 9 d) 9 e) 8 f) 8

B.

a) 9 R5 b) 9 R6 c) 7 R2 d) 9 R4 e) 9 R4 f) 8 R2

Topic B: Divisibility

Divisibility is when two numbers can be divided without a remainder.

For example, 18 is divisible by 3 because $18 \div 3 = 6$.
18 is not divisible by 5 because $18 \div 5 = 3$ with a remainder of 3.

Divisibility by 2

A number is divisible by 2 if it ends in 0, 2, 4, 6 or 8.

> **Example A:** 438, 540, 256, 12, 154 are all divisible by 2 because each number ends in a 0, 2, 4, 6 or 8.
>
> **Example B:** 351, 945, 849, 347,193 are not divisible by 2 because each number **does not** end in a 0, 2, 4, 6 or 8.

Exercise One

Circle the numbers that are divisible by 2. Check your work using the answer key at the end of the exercise.

a) 22	b) 35	c) 17
d) 10	e) 274	f) 345
g) 639	h) 456	i) 2 437
j) 7 548	k) 6 754	l) 5 543

Answers to Exercise One

a) 22 d) 10 e) 274 h) 456 j) 7 548 k) 6 754

Divisibility by 3

A number is divisible by 3 if the sum (total) of the digits is divisible by 3.

Example A: 63
$6+3=9$
9 is divisible by 3, so 63 is divisible by 3.

Example B: 148
$1+4+8=13$
13 is not divisible by 3, so 148 is not divisible by 3.

Example C: 5 892
$5+8+9+2=24$
Add again: $2+4=6$
6 is divisible by 3, so 5 892 is divisible by 3.

Exercise Two

Circle the numbers that are divisible by 3. Check your work using the answer key at the end of the exercise.

a) 27	b) 35	c) 81
d) 94	e) 274	f) 581
g) 564	h) 316	i) 3 175
j) 1 458	k) 1 890	l) 3 934

Answers to Exercise Two
a) 27 c) 81 g) 564 j) 1 458 k) 1 890

Divisibility by 5

A number is divisible by 5 if the number ends in 0 or 5.

Example A: 290 is divisible by 5 because it ends in 0.

Example B: 132 is not divisible by 5 because it does not end in 0 or 5.

Exercise Three

Circle the numbers that are divisible by 5. Check your work using the answer key at the end of the exercise.

a) 45	b) 84	c) 72
d) 90	e) 800	f) 753
g) 672	h) 355	i) 6 009
j) 6 375	k) 7 020	l) 1 704

Answers to Exercise Three

a) 45 d) 90 e) 800 h) 355 j) 6 375 k) 7 020

Exercise Four

Put a check mark for each number that divides evenly.
Check your work using the answer key at the end of the exercise.

	Number	2	3	5
a	474			
b	615			
c	412			
d	865			
e	300			
f	831			
g	525			
h	350			
i	710			
j	429			
k	906			
l	634			
m	430			
n	275			

Answers to Exercise Four

	Number	2	3	5
a	474	√	√	
b	615		√	√
c	412	√		
d	865			√
e	300	√	√	√
f	831		√	
g	525		√	√
h	350	√	√	√
i	710	√		√
j	429		√	
k	906	√	√	
l	634	√		
m	430	√		√
n	275			√

Exercise Five

Put a check mark for each number that divides evenly. Check your work using the answer key at the end of the exercise.

	Number	2	3	5
a	3 585			
b	7 548			
c	5 890			
d	6 318			
e	3 905			
f	5 280			
g	1 760			
h	8 007			
i	6 752			
j	7 375			
k	5 523			
l	2 625			
m	8 956			
n	9 150			

Answers to Exercise Five

	Number	2	3	5
a	3 585		√	√
b	7 548	√	√	
c	5 890	√		√
d	6 318	√	√	
e	3 905			√
f	5 280	√	√	√
g	1 760	√		√
h	8 007		√	
i	6 752	√		
j	7 375			√
k	5 532		√	
l	2 625		√	√
m	8 956	√		
n	9 150	√	√	√

Divisibility by 9

A number is divisible by 9 if the sum (total) of the digits is divisible by 9.

Example A: 135

$1+3+5=9$

9 is divisible by 9, so 135 is divisible by 9.

Example B: 7 578

$7+5+7+8=27$

27 is divisible by 9, so 7 578 is divisible by 9.

Example C: 57 896

$5+7+8+9+6=35$

35 is not divisible by 9, so 57 896 is not divisible by 9.

Exercise Six

Circle the numbers that are divisible by 3. Check your work using the answer key at the end of the exercise.

a) 538	b) 783	c) 954
d) 762	e) 6 213	f) 5 742
g) 7 083	h) 5 738	i) 34 937
j) 39 402	k) 74 124	l) 45 683

Answers to Exercise Six

b) 783 c) 954 d) 762 e) 6213 f) 5 742 g) 7 083 j) 39 402 k) 74 124

Exercise Seven

Put a check mark for each number that divides evenly. Check your work using the answer key at the end of the exercise.

	Number	2	3	5	9
a	453				
b	320				
c	216				
d	726				
e	712				
f	425				
g	630				
h	375				
i	990				
j	210				

Answers to Exercise Seven

	Number	2	3	5	9
a	453		√		
b	320	√		√	
c	216	√	√		√
d	726	√	√		
e	712	√			
f	425			√	
g	630	√	√	√	√
h	375		√	√	
i	990	√	√	√	√
j	210	√	√	√	

Exercise Eight

Put a check mark for each number that divides evenly. Check your work using the answer key at the end of the exercise.

	Number	2	3	5	9
a	837				
b	360				
c	648				
d	981				
e	465				
f	1 002				
g	3 520				
h	6 435				
i	8 022				
j	7 425				

Answers to Exercise Eight

	Number	2	3	5	9
a	837		√		√
b	360	√	√	√	√
c	648	√	√		√
d	981		√		√
e	465		√	√	
f	1 002	√	√		
g	3 520	√		√	
h	6 435		√	√	√
i	8 022	√	√		
j	7 425		√	√	√

Exercise Nine

Put a check mark for each number that divides evenly. Check your work using the answer key at the end of the exercise.

	Number	2	3	5	9
a	1 200				
b	7 164				
c	3 681				
d	8 205				
e	2 745				
f	4 320				
g	7 350				
h	4 000				
i	1 368				
j	6 720				

Answers to Exercise Nine

	Number	2	3	5	9
a	1 200	√	√	√	
b	7 164	√	√		√
c	3 681		√		√
d	8 205		√	√	
e	2 745		√	√	√
f	4 320	√	√	√	√
g	7 350	√	√	√	
h	4 000	√		√	
i	1 368	√	√		√
j	6 720	√	√	√	

Topic B: Self-Test

Mark /12 Aim 9/12

A. From the list of numbers, write the numbers. **6 marks**

48, 925, 1 467, 2 645, 5 534, 7 512, 31 183, 52 361

a) Which numbers are divisible by 2?

b) Which numbers are divisible by 3?

c) Which numbers are divisible by 5?

d) Which numbers are divisible by 9?

B. Put a check mark for each number that divides evenly. **6 marks**

	Number	**2**	**3**	**5**	**9**
a	1 200				
b	7 164				
c	3 681				
d	8 205				
e	2 745				

Answers to Topic B Self-Test

A.

a) 48, 7 512, 5 534 b) 48, 1 467, 7 512 c) 925, 2 645

d) 1 467

B.

	Number	2	3	5	9
a	1 200	√	√	√	
b	7 164	√	√		√
c	3 681		√		√
d	8 205		√	√	
e	2 745		√	√	√

Topic C: Dividing Larger Numbers by One Digit Divisors

Several methods are used to divide larger numbers. This book will only teach one method. If you have learned a different method for dividing, ask your instructor to review it with you. You can use the practice exercises in this workbook using whichever method you prefer.

Division has four steps which are repeated until the dividend is completely divided. Work through the three examples which show these steps.

Step 1: Divide

Step 2: Multiply

Step 3: Subtract and **compare** the remainder to the divisor

Step 4: Bring down the next digit in the dividend and **repeat.**

Example A: $294 \div 7 =$ _____ Rewrite as $7\overline{)294}$

Step 1: **Divide**.

- You are finding a trial quotient using the multiplication tables or division facts.
- Look at the dividend one digit at a time.
- The first digit is a 2, which is really 2 hundreds.
- Will 7 "go into" 2 – can you divide 2 by 7? **NO**.
- Look at the first 2 digits, 29, which is really 29 tens.
- Will 7 go into 29? **YES**. ($4 \times 7 = 28$)
- The first number in the trial quotient is **4. Place the 4 in the quotient directly above the 9 tens.** The 4 is 4 tens in the quotient.

$$7\overline{)\begin{array}{r}4\\294\end{array}}$$

Step 2: Multiply $4 \times 7 = 28$
Write the 28 under the 29. Draw a line.

$$7\overline{)\begin{array}{r}4\\294\\\underline{28}\end{array}}$$

Step 3: **Subtract** $29 - 28 = 1$ (ten) and check $1 < 7$ ✓

$$\begin{array}{r} 4 \\ 7\overline{)294} \\ \underline{28} \\ 1 \end{array}$$

Step 4: Bring down the next number in the dividend (4) and you have 14. This **14 is the number that you must now divide.**

$$\begin{array}{r} 4 \\ 7\overline{)294} \\ \underline{28}\downarrow \\ 14 \end{array}$$

REPEAT

Step 1: **Divide** $14 \div 7 = 2$
Put the 2 in the quotient right after the 4 in the ones place.

$$\begin{array}{r} 42 \\ 7\overline{)294} \\ \underline{28}\downarrow \\ 14 \end{array}$$

Step 2: **Multiply** $2 \times 7 = 14$
Write the 14 under the 14.

$$\begin{array}{r} 42 \\ 7\overline{)294} \\ \underline{28}\downarrow \\ 14 \\ \underline{14} \end{array}$$

Step 3: **Subtract** $14 - 14 = 0$
There is 0 remainder. Check $0 < 7$ ✓

$$\begin{array}{r} 42 \\ 7\overline{)294} \\ \underline{28}\downarrow \\ 14 \\ \underline{14} \\ 0 \end{array}$$

Step 4: No more numbers in the dividend to bring down.

Example B: $128 \div 2 =$ _____

$$\begin{array}{r} 6 \\ 2\overline{)128} \\ \underline{12}\downarrow \\ 08 \end{array} \qquad \begin{array}{r} 64 \\ 2\overline{)128} \\ \underline{12}\downarrow \\ 08 \\ \underline{8} \\ 0 \end{array}$$

Step 1: Divide

- Can 2 "go into" 1? **NO**
- Can 2 go into 12? **YES**
- How many times?

$2 \times 6 = 12$ $\qquad$ $12 \div 2 = 6$

The first number in the trial quotient is **6**. Put the 6 in the quotient directly above the 2 tens in the dividend.

Step 2: Multiply $6 \times 2 = 12$

Step 3: Subtract $12 - 12 = 0$

Check $0 < 12$ ✓

Step 4: Bring down the next digit in the dividend (8). **8** is now the number to be divided.

REPEAT

Divide $8 \div 2 = 4$

Multiply $4 \times 2 = 8$

Subtract $8 - 8 = 0$

Check $0 < 2$ ✓

Bring down the next digit.

No more digits in the dividend.

$128 \div 2 = 64$

Exercise One

Find the quotients (divide, multiply, subtract, compare).
Check your work using the answer key at the end of the exercise.

a) $4\overline{)364}$ b) $2\overline{)144}$ c) $5\overline{)455}$

d) $7\overline{)651}$ e) $8\overline{)144}$ f) $2\overline{)166}$

g) $7\overline{)588}$ h) $2\overline{)196}$ i) $5\overline{)230}$

j) $8\overline{)584}$ k) $6\overline{)366}$ l) $4\overline{)244}$

m) $5\overline{)375}$ n) $8\overline{)200}$ o) $2\overline{)628}$

p) $7\overline{)357}$ q) $9\overline{)837}$ r) $8\overline{)248}$

s) $8\overline{)312}$ t) $7\overline{)462}$ u) $5\overline{)295}$

v) $6\overline{)384}$ w) $2\overline{)276}$ x) $4\overline{)372}$

Answers to Exercise One

a) 91	b) 72	c) 91	d) 93	e) 18	f) 83	g) 84
h) 98	i) 46	j) 73	k) 61	l) 61	m) 75	n) 25
o) 314	p) 51	q) 93	r) 31	s) 39	t) 66	u) 59
v) 64	w) 138	x) 93				

Exercise Two

Find the quotients (divide, multiply, subtract, compare).
Check your work using the answer key at the end of the exercise.

a) $4\overline{)248}$ b) $4\overline{)184}$ c) $5\overline{)420}$

d) $9\overline{)576}$ e) $7\overline{)427}$ f) $6\overline{)486}$

g) $3\overline{)189}$ h) $7\overline{)266}$ i) $8\overline{)472}$

j) $7\overline{)784}$ k) $3\overline{)768}$ l) $8\overline{)296}$

m) $9\overline{)315}$ n) $6\overline{)252}$ o) $3\overline{)249}$

p) $6\overline{)426}$ q) $7\overline{)406}$ r) $8\overline{)248}$

s) $5\overline{)355}$ t) $6\overline{)462}$ u) $2\overline{)196}$

v) $8\overline{)184}$ w) $5\overline{)930}$ x) $3\overline{)186}$

Answers to Exercise Two

a) 62	b) 46	c) 84	d) 64	e) 61	f) 81	g) 63
h) 38	i) 59	j) 112	k) 256	l) 37	m) 35	n) 42
o) 83	p) 71	q) 58	r) 31	s) 71	t) 77	u) 98
v) 23	w) 186	x) 62				

Example C: $856 \div 8 =$ _____ $8\overline{)856}$

Divide Does 8 go into 8? **YES**
$8 \div 8 = 1$

$$8\overline{)\begin{array}{r}1\\856\end{array}}$$

Multiply $1 \times 8 = 8$

$$8\overline{)\begin{array}{r}1\\856\\\underline{8}\end{array}}$$

Subtract $8 - 8 = 0$
Check $0 < 8$ ✓

$$8\overline{)\begin{array}{r}1\\856\\\underline{8}\\0\end{array}}$$

Bring down the next digit. 5 is now the number to be divided.

$$8\overline{)\begin{array}{r}1\\856\\\underline{8}\downarrow\\05\end{array}}$$

REPEAT

Divide 8 goes into 5? **NO**

You must put a zero to hold the place in the quotient. If a digit is brought down, a digit must be placed in the quotient.

$$\begin{array}{r} 10 \\ 8\overline{)856} \\ \underline{8}\downarrow \\ 05 \end{array}$$

Multiply $0 \times 8 = 0$

$$\begin{array}{r} 10 \\ 8\overline{)856} \\ \underline{8}\downarrow \\ 05 \\ \underline{0} \end{array}$$

Subtract $5 - 0 = 5$

Check $5 < 8$ ✓

$$\begin{array}{r} 10 \\ 8\overline{)856} \\ \underline{8}\downarrow\downarrow \\ 05\downarrow \\ \underline{0}\downarrow \\ 5 \end{array}$$

Bring down the next digit. 56 is now the number to be divided.

$$\begin{array}{r} 10 \\ 8\overline{)856} \\ \underline{8}\downarrow\downarrow \\ 05\downarrow \\ \underline{0}\downarrow \\ 56 \end{array}$$

REPEAT

Divide 8 goes into 56? **YES**

$56 \div 8 = 7$

Write 7 in the quotient in the ones place above the 6 in the dividend.

$$\begin{array}{r} 107 \\ 8\overline{)856} \\ \underline{8}\downarrow\downarrow \\ 05\downarrow \\ \underline{0}\downarrow \\ 56 \\ \underline{56} \\ 0 \end{array}$$

Multiply $7 \times 8 = 56$

$$\begin{array}{r} 107 \\ 8\overline{)856} \\ \underline{8}\downarrow\downarrow \\ 05\downarrow \\ \underline{0}\downarrow \\ 56 \\ \underline{56} \end{array}$$

Subtract $56 - 56 = 0$

Check $0 < 8$ ✓

$$\begin{array}{r} 107 \\ 8\overline{)856} \\ \underline{8}\downarrow\downarrow \\ 05\downarrow \\ \underline{0}\downarrow \\ 56 \\ \underline{56} \\ 0 \end{array}$$

Bring down No more digits.

Exercise Three

Find the quotients (divide, multiply, subtract, compare).
Check your work using the answer key at the end of the exercise.

a) $7\overline{)721}$ b) $9\overline{)954}$ c) $3\overline{)927}$

d) $3\overline{)621}$ e) $4\overline{)824}$ f) $9\overline{)972}$

g) $7\overline{)714}$ h) $2\overline{)416}$ i) $5\overline{)540}$

j) $6\overline{)654}$ k) $8\overline{)832}$ l) $4\overline{)436}$

m) $5\overline{)515}$ n) $2\overline{)814}$ o) $6\overline{)648}$

p) $8\overline{)856}$ q) $5\overline{)525}$ r) $7\overline{)763}$

s) $9\overline{)945}$ t) $3\overline{)315}$ u) $8\overline{)872}$

v) $4\overline{)416}$ w) $6\overline{)618}$ x) $2\overline{)612}$

Answers to Exercise Three

a) 103	b) 106	c) 309	d) 207	e) 206	f) 108	g) 102
h) 208	i) 108	j) 109	k) 104	l) 109	m) 103	n) 407
o) 108	p) 107	q) 105	r) 109	s) 105	t) 105	u) 109
v) 104	w) 103	x) 306				

Exercise Four

Find the quotients (divide, multiply, subtract, compare).
Check your work using the answer key at the end of the exercise.

a) $6\overline{)624}$ b) $4\overline{)832}$ c) $8\overline{)864}$

d) $2\overline{)608}$ e) $5\overline{)545}$ f) $7\overline{)749}$

g) $9\overline{)918}$ h) $3\overline{)303}$ i) $8\overline{)840}$

j) $4\overline{)412}$ k) $6\overline{)630}$ l) $9\overline{)936}$

m) $5\overline{)520}$ n) $7\overline{)735}$ o) $2\overline{)802}$

p) $3\overline{)924}$ q) $5\overline{)510}$ r) $4\overline{)808}$

s) $8\overline{)848}$ t) $2\overline{)410}$ u) $6\overline{)642}$

v) $7\overline{)756}$ w) $9\overline{)963}$ x) $3\overline{)618}$

Answers to Exercise Four

a) 104	b) 208	c) 108	d) 304	e) 109	f) 107	g) 102
h) 101	i) 105	j) 103	k) 105	l) 104	m) 104	n) 105
o) 401	p) 308	q) 102	r) 202	s) 106	t) 205	u) 107
v) 108	w) 107	x) 206				

One Digit Divisors with Remainders

Do the division exactly the same way that you have been learning. Often there is a remainder after the last subtraction. Write it with the quotient as you already know how to do.

Example 259 ÷ 8 = _____

$$\begin{array}{r} 32 \text{ R } 3 \\ 8\overline{)259} \\ \underline{24\downarrow} \\ 19 \\ \underline{16} \\ 3 \end{array}$$

259 ÷ 8 = 32 R 3

Exercise Five

Divide and show any remainders. Check your work using the answer key at the end of the exercise.

a) $2\overline{)93}$ b) $3\overline{)52}$ c) $5\overline{)94}$

d) $7\overline{)74}$ e) $4\overline{)95}$ f) $9\overline{)96}$

g) $6\overline{)97}$ h) $8\overline{)99}$ i) $9\overline{)98}$

j) $4\overline{)59}$ k) $6\overline{)76}$ l) $3\overline{)79}$

m) $7\overline{)96}$ n) $5\overline{)57}$ o) $2\overline{)47}$

p) $8\overline{)91}$ q) $7\overline{)89}$ r) $6\overline{)82}$

s) $5\overline{)67}$ t) $2\overline{)85}$ u) $4\overline{)71}$

v) $3\overline{)65}$ w) $9\overline{)92}$ x) $8\overline{)94}$

Answers to Exercise Five

a)	46 R1	b)	17 R1	c)	18 R4	d)	10 R4	e)	23 R3	f)	10 R6	g)	16 R1
h)	12 R3	i)	10 R8	j)	14 R3	k)	12 R4	l)	26 R1	m)	13 R5	n)	11 R2
o)	23 R1	p)	11 R3	q)	12 R5	r)	13 R4	s)	13 R2	t)	42 R1	u)	17 R3
v)	21 R2	w)	10 R2	x)	11 R6								

To check your division, do this:

- multiply quotient × divisor
- add on any remainder
- the product will equal the dividend if your arithmetic is correct.

Example

$$\begin{array}{r} 52 \text{ R } 1 \\ 9\overline{)469} \\ \underline{45}\downarrow \\ 19 \\ \underline{18} \\ 1 \end{array} \qquad \begin{array}{r} 52 \\ \times\ 9 \\ \hline 468 \\ \\ +\ 1 \\ \hline \end{array}$$

Exercise Six

Divide and check your answer by multiplying. Check your work using the answer key at the end of the exercise.

a) $6\overline{)68}$ b) $4\overline{)85}$ c) $7\overline{)87}$

d) $5\overline{)78}$ e) $2\overline{)59}$ f) $8\overline{)92}$

g) $3\overline{)49}$ h) $9\overline{)91}$ i) $4\overline{)62}$

j) $8\overline{)89}$ k) $6\overline{)80}$ l) $2\overline{)73}$

m) $7\overline{)78}$ n) $5\overline{)61}$ o) $3\overline{)86}$

p) $9\overline{)95}$ q) $8\overline{)98}$ r) $6\overline{)75}$

s) $4\overline{)49}$ t) $7\overline{)99}$ u) $5\overline{)83}$

v) $2\overline{)31}$ w) $3\overline{)94}$ x) $9\overline{)97}$

Answers to Exercise Six

a)	11 R2	b)	21 R1	c)	12 R3	d)	15 R3	e)	29 R1	f)	11 R4	g)	16 R1
h)	10 R1	i)	15 R2	j)	11 R1	k)	13 R2	l)	36 R1	m)	11 R1	n)	12 R1
o)	28 R2	p)	10 R5	q)	12 R2	r)	12 R3	s)	12 R1	t)	14 R1	u)	16 R3
v)	15 R1	w)	31 R1	x)	10 R7								

Exercise Seven

Divide and check your answer by multiplying. Check your work using the answer key at the end of the exercise.

a) $7\overline{)709}$ b) $2\overline{)423}$ c) $5\overline{)538}$

d) $4\overline{)609}$ e) $9\overline{)406}$ f) $6\overline{)125}$

g) $3\overline{)605}$ h) $9\overline{)928}$ i) $3\overline{)962}$

j) $4\overline{)805}$ k) $8\overline{)301}$ l) $2\overline{)807}$

m) $6\overline{)725}$ n) $7\overline{)320}$ o) $9\overline{)140}$

p) $8\overline{)483}$ q) $2\overline{)197}$ r) $6\overline{)307}$

s) $5\overline{)504}$ t) $8\overline{)709}$ u) $7\overline{)876}$

v) $4\overline{)101}$ w) $3\overline{)269}$ x) $5\overline{)473}$

Answers to Exercise Seven

a)	101 R2	b)	211 R1	c)	107 R3	d)	152 R1	e)	45 R1	f)	20 R5	g)	201 R2
h)	103 R1	i)	320 R2	j)	201 R1	k)	37 R5	l)	403 R1	m)	120 R5	n)	45 R5
o)	15 R5	p)	60 R3	q)	98 R1	r)	51 R1	s)	100 R4	t)	88 R5	u)	125 R1
v)	25 R1	w)	89 R2	x)	94 R3								

Exercise Eight

Divide and check your answer for by multiplying. Check your work using the answer key at the end of the exercise.

a) $8\overline{)105}$ b) $6\overline{)256}$ c) $2\overline{)563}$

d) $9\overline{)546}$ e) $4\overline{)375}$ f) $5\overline{)243}$

g) $3\overline{)416}$ h) $9\overline{)682}$ i) $7\overline{)251}$

j) $6\overline{)819}$ k) $7\overline{)657}$ l) $8\overline{)878}$

m) $2\overline{)759}$ n) $5\overline{)758}$ o) $3\overline{)821}$

p) $4\overline{)758}$ q) $9\overline{)264}$ r) $6\overline{)541}$

s) $7\overline{)426}$ t) $3\overline{)571}$ u) $2\overline{)645}$

v) $5\overline{)961}$ w) $8\overline{)993}$ x) $4\overline{)917}$

Answers to Exercise Eight

a)	13 R1	b)	42 R4	c)	281 R1	d)	60 R6	e)	93 R3	f)	48 R3	g)	138 R2
h)	75 R7	i)	35 R6	j)	136 R3	k)	93 R6	l)	109 R6	m)	379 R1	n)	151 R3
o)	273 R2	p)	189 R2	q)	29 R3	r)	90 R1	s)	60 R6	t)	190 R1	u)	322 R1
v)	192 R1	w)	124 R1	x)	229 R1								

Topic C: Self-Test

Mark /24 **Aim 19/24**

A. Find the quotient. **6 marks**

a) $6\overline{)96}$ b) $4\overline{)92}$ c) $7\overline{)91}$

d) $2\overline{)93}$ e) $5\overline{)94}$ f) $3\overline{)52}$

B. Divide. **6 marks**

a) $7\overline{)182}$ b) $8\overline{)736}$ c) $6\overline{)162}$

d) $5\overline{)295}$ e) $4\overline{)184}$ f) $9\overline{)576}$

C. Divide and show your check for each answer. **12 marks**
(1 mark for question, 1 mark for check)

a) $9\overline{)705}$

b) $4\overline{)257}$

c) $7\overline{)899}$

d) $5\overline{)538}$

e) $8\overline{)876}$

f) $6\overline{)628}$

Answers to Topic C Self-Test

A.

a) 16 b) 23 c) 13 d) 46 R1 e) 18 R4 f) 17 R1

B.

a) 26 b) 92 c) 27 d) 59 e) 46 f) 64

C.

a) 78 R3 b) 64 R1 c) 128 R3 d) 107 R3 e) 109 R4 f) 104 R4

Topic D: Dividing by Two and Three Digit Divisors

Finding Trial Quotients:

When dividing by 2-digit numbers, you will need to **estimate** the quotient. This guess is called a **trial quotient**.

Example A: $624 \div 24$

Step 1: Divide

$$24\overline{)624}$$

Think: $2\overline{)6}$ is 3. So $24\overline{)62}$ is about 3.

Step 2: Multiply and subtract.

$$\begin{array}{r} 3 \\ 24\overline{)624} \\ \underline{72} \end{array}$$

Since 72 > 67, 3 is **too large**.

Step 3: Try a smaller number, multiply and subtract.

$$\begin{array}{r} 2 \\ 24\overline{)624} \\ \underline{48} \\ 14 \end{array}$$

Since 14 < 24, 2 is correct.

Step 4: Finish the problem.

Example B: $630 \div 15$

Step 1: Divide.

$$15\overline{)630}$$

15 rounds to 20. Think $2\overline{)6}$ is 3. So $15\overline{)63}$ is about 3.

Step 2: Multiply and subtract.

$$\begin{array}{r} 3 \\ 15\overline{)630} \\ \underline{45} \\ 18 \end{array}$$

Since 18 > 15, 3 is too small.

Step 3: Try a larger number, multiply and subtract.

$$\begin{array}{r} 4 \\ 15\overline{)630} \\ \underline{60} \\ 3 \end{array}$$

Since 3 < 15, 4 is correct.

Step 4: Finish the problem.

Exercise One

In each question, the **trial quotient** is either too large or too small. Multiply. Write too large or too small on the line. Then, write the correct trial quotient beside. Check your work using the answer key at the end of the exercise.

a) $25\overline{)475}$ $\begin{array}{r} 2 \\ \underline{50} \end{array}$ too large, 1

b) $15\overline{)682}$ 3 _____

c) $18\overline{)813}$ 5 _____

d) $25\overline{)810}$ 2 _____

e) $33\overline{)891}$ 3 _____

f) $18\overline{)819}$ 3 _____

g) $27\overline{)727}$ 3 _____

h) $35\overline{)652}$ 2 _____

i) $25\overline{)650}$ 3 _____

j) $34\overline{)176}$ 4 _____

k) $12\overline{)420}$ 4 _____

l) $43\overline{)801}$ 2 _____

m) $31\overline{)899}$ _____ n) $18\overline{)648}$ _____

o) $27\overline{)946}$ _____ p) $23\overline{)943}$ _____

q) $24\overline{)578}$ _____ r) $29\overline{)406}$ _____

s) $48\overline{)892}$ _____ t) $28\overline{)534}$ _____

u) $37\overline{)939}$ _____ v) $28\overline{)854}$ _____

w) $19\overline{)361}$ _____ x) $38\overline{)974}$ _____

Answers to Exercise One

a) too large, 1	b) too small, 4	c) too large, 4	d) too small, 3	e) too large, 2
f) too small, 4	g) too large, 2	h) too large, 1	i) too large, 2	j) too small, 5
k) too large, 3	l) too large, 1	m) too large, 2	n) too large, 3	o) too large, 3
p) too small, 4	q) too large, 2	r) too large, 1	s) too large, 1	t) too large, 1
u) too large, 2	v) too small, 3	w) too large, 1	x) too large, 2	

Exercise Two

In each question, the **trial quotient** is either too large or too small. Multiply. Write too large or too small on the line. Then, write the correct trial quotient beside. Check your work using the answer key at the end of the exercise.

a) $61\overline{)2\ 419}$ with trial quotient 4; 2 44 — too large, 3

b) $42\overline{)1\ 253}$ with trial quotient 3 ____________________

c) $59\overline{)2\ 847}$ with trial quotient 3 ____________________

d) $32\overline{)2\ 752}$ with trial quotient 9 ____________________

e) $67\overline{)2\ 542}$ with trial quotient 4 ____________________

f) $71\overline{)2\ 914}$ with trial quotient 3 ____________________

g) $82\overline{)1\ 958}$ with trial quotient 3 ____________________

h) $18\overline{)7\ 250}$ with trial quotient 3 ____________________

i) $25\overline{)1\ 550}$ with trial quotient 5 ____________________

j) $19\overline{)9\ 395}$ with trial quotient 5 ____________________

k) $39\overline{)3\,854}$ _____

l) $24\overline{)9\,648}$ _____

m) $28\overline{)1\,176}$ _____

n) $23\overline{)1\,387}$ _____

o) $48\overline{)2\,973}$ _____

p) $48\overline{)2\,396}$ _____

q) $28\overline{)1\,665}$ _____

r) $23\overline{)1\,387}$ _____

s) $47\overline{)1\,928}$ _____

t) $79\overline{)2\,765}$ _____

u) $52\overline{)1\,968}$ _____

v) $72\overline{)2\,813}$ _____

w) $94\overline{)8\,126}$ _____

x) $59\overline{)4\,163}$ _____

Answers to Exercise Two

a)	too large, 3	b)	too large, 2	c)	too small, 4	d)	too large, 8	e)	too large, 3
f)	too small, 4	g)	too large, 2	h)	too small, 4	i)	too small, 6	j)	too large, 4
k)	too small, 9	l)	too large, 4	m)	too small, 4	n)	too large, 6	o)	too small, 6
p)	too large, 4	q)	too large, 5	r)	too large, 6	s)	too small, 4	t)	too large, 3
u)	too large, 3	v)	too large, 3	w)	too large, 8	x)	too small, 7		

Example A: $78\overline{)2\ 706}$

Since 78 rounds to 80, think $8\overline{)27}$. 8 goes into $27 \approx 3$. 3 would be a good trial quotient.

$$\begin{array}{r} 3 \\ 78\overline{)2\ 706} \\ 2\ 34 \\ \hline 36 \end{array}$$

Since $36 < 78$, 3 is a good trial quotient.

Example B: $27\overline{)2205}$

Since 27 rounds to 30, think $3\overline{)22}$. 3 goes into $22 \approx 7$. 7 would be a good trial quotient.

$$\begin{array}{r} 7 \\ 27\overline{)2\ 205} \\ 1\ 89 \\ \hline 31 \end{array}$$

$31 > 27$, so 7 is too small. A better trial quotient would be 8.

Exercise Three

Find the first digit in the **trial quotient**. Check your work using the answer key at the end of the exercise.

a) $43\overline{)1\,772}$

b) $64\overline{)3\,276}$

c) $28\overline{)6\,008}$

$$\begin{array}{r} 4 \\ 4\overline{)17} \\ \underline{16} \\ 1 \end{array}$$

$1 < 4$

d) $33\overline{)2\,731}$

e) $59\overline{)4\,164}$

f) $75\overline{)2\,420}$

g) $54\overline{)3\,316}$

h) $38\overline{)2\,759}$

i) $46\overline{)3\,827}$

j) $35\overline{)1\,533}$

k) $83\overline{)7\,237}$

l) $77\overline{)6\,763}$

m) $93\overline{)3\,724}$

n) $52\overline{)4\,690}$

o) $86\overline{)2\,089}$

p) $26\overline{)1\ 417}$ q) $72\overline{)1\ 462}$ r) $27\overline{)6\ 939}$

s) $32\overline{)7\ 840}$ t) $24\overline{)7\ 605}$ u) $16\overline{)8\ 640}$

v) $45\overline{)3\ 060}$ w) $38\overline{)2\ 158}$ x) $42\overline{)1\ 491}$

Answers to Exercise Three

a) 4	b) 5	c) 2	d) 8	e) 7	f) 3	g) 6
h) 7	i) 8	j) 4	k) 8	l) 8	m) 4	n) 9
o) 2	p) 5	q) 2	r) 2	s) 2	t) 3	u) 5
v) 6	w) 5	x) 3				

Dividing by Two and Three Digit Divisors

Dividing by large divisors is a challenge!

You must **estimate** how many times one number will divide into another. Use pencil and have an eraser close by when you do these questions. You will use the same steps that you already know.

Example A: $964 \div 75 =$ _____

Step 1: Divide

- Does 75 go into 9? **NO**
- Does 75 go into 96? **YES**
- **Estimate**

  Round 75 to 80 – think "8"

  Round 96 to 100 – think "10"

  How many 8's in 10? ($8 \times 1 = 8$, $10 \div 8 = 1$)

  The estimate for the first digit in the trial quotient is 1.
- Write **1** in the quotient above the 6 tens.

$$75\overline{)964}\quad 1$$

Step 2: Multiply $1 \times 75 = 75$

Write 75 under 96.

$$\begin{array}{r} 1 \\ 75\overline{)964} \\ \underline{75} \end{array}$$

Step 3: Subtract $96 - 75 = 21$

Check $21 < 75$? ✓

$$\begin{array}{r} 1 \\ 75\overline{)964} \\ \underline{75} \\ 21 \end{array}$$

Step 4: **Bring down the next digit** in the dividend. 214 is now the number to be divided.

$$\begin{array}{r} 1 \\ 75\overline{)964} \\ \underline{75}\downarrow \\ 214 \end{array}$$

REPEAT

Step 1: **Divide**

- Does 75 go into 214? **YES**
- Estimate 75 as 80 – think "8"
  - Estimate 214 as 200 – think "20"
  - 8 goes into 20 $\approx$ 2 times ($8 \times 2 = 16$, so $20 \div 8 \approx 2$)
- The estimate for the second digit in the trial quotient is 2. Write 2 in the quotient above the 4 in the dividend.

$$\begin{array}{r} 12 \\ 75\overline{)964} \\ \underline{75}\downarrow \\ 214 \end{array}$$

Step 2: **Multiply** $2 \times 75 = 150$

Write 150 under the 214.

$$\begin{array}{r} 12 \\ 75\overline{)964} \\ \underline{75}\downarrow \\ 214 \\ \underline{150} \end{array}$$

Step 3: **Subtract and check** that the remainder is less than the divisor.

$$\begin{array}{r} 12 \\ 75\overline{)964} \\ \underline{75}\downarrow \\ 214 \\ \underline{150} \\ 64 \end{array}$$

Step 4: **Bring down** – no more digits in dividend.

To check your answer

$$\begin{array}{r} 75 \\ \times\ 12 \\ \hline 150 \\ 750 \\ \hline 900 \\ +\ 64 \\ \hline 964 \end{array}$$

remainder

Example B: $2\,975 \div 42 =$ _____

Step 1: **Divide**

- Does 42 go into 2? **NO**
- Does 42 go into 29? **NO**
- Does 42 go into 297? **YES**

Estimate

Round 42 to 40 and think "4".
Round 297 to 300 and think "30".
4 goes into 30 $\approx$ 7 times ($4 \times 7 = 28$, so $30 \div 4 \approx 7$)
Your estimate is 7.

$$42\overline{)2\,975}\quad \overset{7}{}$$

Step 2: **Multiply** $7 \times 42 = 294$

$$\begin{array}{r} 7 \\ 42\overline{)2\,975} \\ \underline{2\,94} \end{array}$$

Step 3: **Subtract** $297 - 294 = 3$

Check $3 < 42$ ✓

$$\begin{array}{r} 7 \\ 42\overline{)2\,975} \\ \underline{2\,94} \\ 3 \end{array}$$

Step 4: **Bring down the next digit** in the dividend. 35 is now the number to be divided.

$$\begin{array}{r} 7 \\ 42\overline{)2\,975} \\ \underline{2\,94}\downarrow \\ 35 \end{array}$$

REPEAT

Step 1: **Divide**

- Does 42 go into 35? **NO**
- **Place a 0 in the quotient above the 5 ones in the dividend to hold the ones place.**

$$\begin{array}{r} 70 \\ 42\overline{)2\,975} \\ \underline{2\,94}\downarrow \\ 35 \end{array}$$

Step 2: **Multiply** $0 \times 42 = 0$

$$\begin{array}{r} 70 \\ 42\overline{)2\,975} \\ \underline{2\,94}\downarrow \\ 35 \\ \underline{0} \end{array}$$

Step 3: **Subtract** $35 - 0 = 35$

Check $35 < 42$ ✓

$$\begin{array}{r} 70 \\ 42\overline{)2\,975} \\ \underline{2\,94}\downarrow \\ 35 \\ \underline{0} \\ 35 \end{array}$$

Step 4: No other digits in the dividend to bring down.

$2\,975 \div 42 = 70$ R 35

Exercise Four

Carefully divide these questions. Be careful to keep the hundreds in line with the hundreds, the tens with the tens, and so on. You might want to use squared paper for long division. Check your work using the answer key at the end of the exercise.

If you are having **any** difficulty, ask your instructor to watch you doing a few questions to be sure you are using a correct method.

a) $10\overline{)720}$ b) $12\overline{)564}$ c) $21\overline{)882}$

d) $22\overline{)946}$ e) $32\overline{)1\,632}$ f) $23\overline{)943}$

g) $62\overline{)2\,528}$ h) $71\overline{)2\,414}$ i) $24\overline{)578}$

j) $82\overline{)2\,958}$ k) $18\overline{)6\,250}$ l) $25\overline{)1\,550}$

m) $19\overline{)9\ 595}$ n) $47\overline{)3\ 854}$ o) $58\overline{)6\ 500}$

p) $24\overline{)9\ 648}$ q) $49\overline{)1\ 312}$ r) $67\overline{)7\ 683}$

Answers to Exercise Four

a) 72	b) 47	c) 42	d) 43	e) 51
f) 41	g) 40 R48	h) 34	i) 24 R2	j) 36 R6
k) 347 R4	l) 62	m) 505	n) 82	o) 112 R4
p) 402	q) 26 R38	r) 114 R45		

If the estimate for your trial quotient is too large the result of the multiplication will be larger than the numbers in the dividend.

Divide Trial estimate is 4.

Multiply $4 \times 23 = 92$
92 is larger than 78, so 4 is too large an estimate. Erase it. Try 3. $3 \times 23 = 69$
3 is the correct estimate and you can complete the division.

$23\overline{)784}$ $\quad$ $\begin{array}{r} 4 \\ 23\overline{)784} \\ \underline{92} \end{array}$ $\quad$ $\begin{array}{r} 34 \text{ R } 2 \\ 23\overline{)784} \\ \underline{69}\downarrow \\ 94 \\ \underline{92} \\ 2 \end{array}$

If the estimate is too small, the result of the subtraction will be larger than the divisor.

Divide Trial estimate is 5.

Multiply $5 \times 72 = 360$

Subtract $448 - 360 = 88$
Check $88 < 72$? **NO**, 88 is greater than 72.
So 5 is too small. Erase it and use a larger number.
6 will be a better estimate.

Divide $448 \div 72 \approx 6$

Multiply $6 \times 72 = 432$

Subtract $448 - 432 = 16$ Check $16 < 72$ ✓

Bring down the next digit and complete the division.

$72\overline{)4\ 487}$ $\quad$ $\begin{array}{r} 5 \\ 72\overline{)4\ 487} \\ \underline{360} \end{array}$ $\quad$ $\begin{array}{r} 62 \text{ R } 23 \\ 72\overline{)4\ 487} \\ \underline{4\ 32}\downarrow \\ 1676 \\ \underline{1446} \\ 23 \end{array}$

Exercise Five

Divide and check your work by multiplying. Check your work using the answer key at the end of the exercise.

a) $31\overline{)899}$

b) $28\overline{)1\,176}$

c) $24\overline{)192}$

d) $23\overline{)1\,387}$

e) $48\overline{)2\,593}$

f) $19\overline{)1\,653}$

g) $13\overline{)169}$

h) $24\overline{)2\,496}$

i) $28\overline{)1\,765}$

j) $35\overline{)4\,165}$

k) $36\overline{)8\,647}$

l) $55\overline{)3\,462}$

m) $29\overline{)406}$

n) $62\overline{)3\,782}$

o) $26\overline{)3\,385}$

Answers to Exercise Five

a) 29	b) 42	c) 8	d) 60 R7	e) 54 R1
f) 87	g) 13	h) 104	i) 63 R1	j) 119
k) 240 R7	l) 62 R52	m) 14	n) 61	o) 130 R5

Exercise Six

Divide and check your work by multiplying. Check your work using the answer key at the end of the exercise.

a) $18\overline{)648}$ b) $26\overline{)6\ 766}$ c) $52\overline{)1\ 968}$

d) $84\overline{)8\ 640}$ e) $72\overline{)2\ 883}$ f) $94\overline{)8\ 126}$

g) $20\overline{)4\ 060}$ h) $47\overline{)1\ 728}$ i) $33\overline{)1\ 886}$

j) $25\overline{)5\ 750}$ k) $79\overline{)2\ 765}$ l) $42\overline{)8\ 442}$

m) $57\overline{)9\,144}$ n) $96\overline{)20\,160}$ o) $75\overline{)23\,550}$

Answers to Exercise Six

a) 36	b) 260 R6	c) 37 R44	d) 102 R72	e) 40 R3
f) 86 R 42	g) 203	h) 36 R36	i) 57 R5	j) 230
k) 35	l) 201	m) 160 R24	n) 210	o) 314

Dividing by 10, 100, 1 000 …

Exercise Seven

Find the quotients. Look for the pattern. Check your work using the answer key at the end of the exercise.

a) $10\overline{)46}$ b) $10\overline{)75}$ c) $10\overline{)136}$ d) $10\overline{)832}$

e) $10\overline{)674}$ f) $10\overline{)952}$ g) $10\overline{)2\ 457}$ h) $10\overline{)3\ 685}$

What is the pattern? When you divide by 10

- The ones digit in the dividend becomes the remainder.

  $10\overline{)324}$ = 32 R 4

- The other numbers in the dividend stay the same but each digit is one place value less.
  - the hundreds become tens
  - the tens become ones
  - the ones become the remainder

Answers to Exercise Seven

a) 4 R6 b) 7 R5 c) 13 R6 d) 83 R2 e) 67 R4
f) 95 R2 g) 245 R7 h) 368 R5

Exercise Eight

Find these quotients. Look for the pattern when you divide.
Check your work using the answer key at the end of the exercise.

a) $100\overline{)386}$ b) $100\overline{)995}$ c) $100\overline{)269}$ d) $100\overline{)175}$

e) $100\overline{)2\ 948}$ f) $100\overline{)4\ 671}$ g) $100\overline{)92\ 045}$ h) $100\overline{)43\ 821}$

When you divide by 100

- The ones and tens digits in the dividend become the remainder.
- The other digits in the dividend stay the same but each digit is **two** places less.
  - the thousands become tens
  - the hundreds become ones
  - the tens and ones become the remainder

Answers to Exercise Eight

a) 3 R86 b) 9 R95 c) 2 R69 d) 1 R75 e) 29 R48
f) 46 R71 g) 920 R45 h) 438 R21

Exercise Nine

Try these. Check your work using the answer key at the end of the exercise.

a) $1\,000\overline{)2\,398}$ b) $1\,000\overline{)6\,475}$ c) $1\,000\overline{)4\,835}$

d) $1\,000\overline{)63\,291}$ e) $1\,000\overline{)82\,405}$ f) $1\,000\overline{)293\,591}$

When you divide by 1 000

- The ones, tens, and hundreds digits become the remainder.
- The other digits stay the same but are **three** place values less.
  - thousands become ones
  - ten thousands become tens
  - hundred thousands become hundreds

Answers to Exercise Nine

a) 2 R398 b) 6 R475 c) 4 R835 d) 63 R291 e) 82 R405
f) 293 R591

Three Digit Divisors

If the divisor has three digits, use the method you know for two-digit divisors, but estimate the divisor to the nearest hundred to find the trial quotient. Be very **careful** to put the first digit in the quotient in the correct place.

Example: 17 902 ÷ 381 = _____

Step 1: Divide

- Does 381 go into 1? **NO**
- Does 381 go into 17? **NO**
- Does 381 go into 179? **NO**
- Does 381 go into 1 790? **YES**

Estimate 381 as 400 – think 4.

Estimate 1 790 as 1 800 – think 18.

4 goes into 18 ≈ 4 times (4 × 4 = 16)

Your estimate is 4. Write 4 in the quotient above the 0 in the dividend.

$$\begin{array}{r} 4 \\ 381\overline{)17\ 902} \end{array}$$

Step 2: Multiply 4 × 381 = 1 524

$$\begin{array}{r} 4 \\ 381\overline{)17\ 902} \\ 15\ 24 \end{array}$$

Step 3: Subtract 1 790 – 1 524 = 266

Check 266 < 381 ✓

$$\begin{array}{r} 4 \\ 381\overline{)17\ 902} \\ 15\ 24 \\ \hline 2\ 66 \end{array}$$

Step 4: **Bring down** the 2. 2 662 is now the number to be divided.

$$\begin{array}{r} 4 \\ 381\overline{)17\ 902} \\ 15\ 24\downarrow \\ \hline 2\ 662 \end{array}$$

REPEAT

Step 1: **Divide** $2\,662 \div 381 =$ _____

Estimate 381 as 400 – think of 4.

Estimate 2 662 as 2 700 – think 27.

4 goes into 27 $\approx$ 6 times ($4 \times 6 = 24$)

Place this estimate in the quotient above the 2.

$$\begin{array}{r} 46 \\ 381\overline{)17\ 902} \\ 15\ 24\downarrow \\ \hline 2\ 662 \end{array}$$

Step 2: **Multiply** $6 \times 381 = 2\,286$

$$\begin{array}{r} 46 \\ 381\overline{)17\ 902} \\ 15\ 24\downarrow \\ \hline 2\ 662 \\ 2\ 286 \\ \hline \end{array}$$

Step 3: **Subtract** $2\,662 - 2\,286 = 376$

Check $376 < 381$ ✓

$$\begin{array}{r} 46 \\ 381\overline{)17\ 902} \\ 15\ 24\downarrow \\ \hline 2\ 662 \\ 2\ 286 \\ \hline 376 \end{array}$$

Step 4: No more digits to bring down.

$17\,902 \div 381 = 46$ R 376

Exercise Ten

Divide and check your answers. These questions are hard work! Check your work using the answer key at the end of the exercise.

a) $115\overline{)8\ 682}$

b) $205\overline{)2\ 384}$

c) $325\overline{)66\ 321}$

d) $241\overline{)13\ 284}$

e) $860\overline{)262\ 412}$

f) $659\overline{)270\ 190}$

Answers to Exercise Ten

a) 75 R57 b) 11 R129 c) 204 R21 d) 55 R29 e) 305 R112
f) 410

Topic D: Self-Test

Mark /12 **Aim 10/12**

A. Divide and check your work for questions b and f using multiplication. 11 marks

a) $185 \div 10 =$

b) $408 \div 50 =$

c) $1\,824 \div 48 =$

d) $72\overline{)6\,768}$

e) $67\overline{)5\,963}$

f) $53\overline{)4\,856}$

g) $91\overline{)8\,736}$

h) $265\overline{)133\ 624}$

i) $606\overline{)26\ 094}$

j) $1\,000\overline{)83\,652}$

Answers to Topic D Self-Test

A.

a) 18 R5	b) 8 R8	c) 38	d) 94	e) 89
f) 91 R33	g) 96	h) 504 R64	i) 43 R36	j) 83 R652

Topic E: Estimating Quotients

In Unit Three you learned a shortcut for multiplying numbers that end with zeros.
Now you will learn a short way to divide numbers that **both** end with zeros. First do this exercise and notice the pattern in the quotients.

Exercise One

Divide. Check your work using the answer key at the end of the exercise.

a) $2\overline{)6}$ b) $20\overline{)60}$ c) $200\overline{)600}$ d) $2\,000\overline{)6\,000}$

e) $5\overline{)25}$ f) $50\overline{)250}$ g) $500\overline{)2\,500}$ h) $5\,000\overline{)25\,000}$

i) $14\overline{)28}$ j) $140\overline{)280}$ k) $1\,400\overline{)2\,800}$ l) $14\,000\overline{)28\,000}$

Answers to Exercise One

a) 3 b) 3 c) 3 d) 3 e) 5 f) 5 g) 5
h) 5 i) 2 j) 2 k) 2 l) 2

Here is the shortcut:

When dividing numbers that both end with zeros, cross off the **same number** of **zeros** from the end of the divisor and the dividend. This is sometimes called **cancelling zeros.**

Example A: $4\,800 \div 60 = 4\,80\cancel{0} \div 6\cancel{0}$

$$6\overline{)480}\quad 80$$

Example B: $23\,000 \div 500 = 23\,0\cancel{0}\cancel{0} \div 5\cancel{0}\cancel{0}$

$$\begin{array}{r} 46 \\ 5\overline{)230} \\ \underline{20}\downarrow \\ 30 \\ \underline{30} \\ 0 \end{array}$$

Example C: $2\cancel{0}\cancel{0}\cancel{0})\overline{680\,\cancel{0}\cancel{0}\cancel{0}}$

$$\begin{array}{r} 340 \\ 2\overline{)680} \\ \underline{6}\downarrow \\ 08 \\ \underline{8}\downarrow \\ 00 \\ \underline{0} \\ 0 \end{array}$$

If you are interested in the facts of arithmetic that make this shortcut work, ask your instructor for an explanation.

Exercise Two

Quickly find the quotients. Remember to cancel the **same number** of zeros in both the divisor and dividend in each question. Check your work using the answer key at the end of the exercise.

a) $30\overline{)90}$ b) $40\overline{)1\,600}$ c) $300\overline{)1\,200}$

d) $400\overline{)20\,000}$ e) $500\overline{)35\,000}$ f) $700\overline{)42\,000}$

g) $60\,000\overline{)2\,400\,000}$ h) $800\,000\overline{)400\,000\,000}$

Answers to Exercise Two

a) 3 b) 40 c) 4 d) 50 e) 70 f) 60 g) 40
h) 500

Rounding Division Questions to Estimate

We round numbers and estimate to get a quick answer.

In division, round the divisor and dividend **before** you divide.

- If the divisor only has one digit, do not round it,
- Round the dividend to make the arithmetic easier for yourself.

Example A: Look at the two ways of rounding this question.
1 796 ÷ 32 = _____

The divisor (32) will round to 30.
This dividend (1 796) can be rounded to 1 800 or to 2 000.

$$30\overline{)1\,800}\quad 60$$

$$30\overline{)2\,000}\quad 66\ \text{R}\ 2$$

$$\begin{array}{r} 1\,8\downarrow \\ 20 \\ 18 \\ \hline 2 \end{array}$$

Rounding 1 796 to 1 800 is easier arithmetic because 18 ÷ 3 works out evenly, so 180 ÷ 3 works out evenly. Both estimates are correct.

Example B: 2 688 ÷ 28 = _____

Round the divisor (28) to 30.
Round the dividend (2 688) to 2 700 or to 3 000.

$$30\overline{)2\,700}\quad 90$$

$$30\overline{)3\,000}\quad 1\,00$$

Both estimates are correct and both are easy to do.

Example C: 2 893 ÷ 47 = _____

Round the divisor (47) to 50.
Round the dividend (2 893) to 2 900 or 3 000.
Which rounded dividend will be easier to divide by 50?

The 3 000 because 5 goes evenly into 30.

$$50\overline{)3\,000}\quad 60$$

Exercise Three

Give an estimated quotient. Show your rounding. Check your work using the answer key at the end of the exercise.

a) $365\overline{)27\ 692}$

b) $23\overline{)34\ 559}$

c) $45\overline{)4\ 590}$

d) $16\overline{)6\ 729}$

e) $56\overline{)4\ 792}$

f) $75\overline{)7\ 648}$

g) $81\overline{)4\ 049}$

h) $68\overline{)5\ 636}$

i) $19\overline{)1\ 672}$

j) $218\overline{)22\ 998}$

k) $557\overline{)41\ 680}$

Answers to Exercise Three

a) $28\,000 \div 400 = 70$
b) $34\,000 \div 20 = 170$
c) $5\,000 \div 50 = 100$
d) $7\,000 \div 20 = 350$
e) $4\,800 \div 60 = 80$
f) $8\,000 \div 80 = 100$
g) $4\,000 \div 80 = 50$
h) $5\,600 \div 70 = 80$
i) $2\,000 \div 20 = 100$
j) $20\,000 \div 200 = 100$
k) $42\,000 \div 600 = 70$

Topic E: Self-Test

Mark /6 Aim 5/6

A. Give an estimated quotient. Show your work. 6 marks

a) $98\overline{)8\ 541}$

b) $27\overline{)2\ 963}$

c) $241\overline{)26\ 348}$

d) $55\overline{)3\ 276}$

e) $24\overline{)1\ 776}$

f) $59\overline{)11\ 830}$

Answers to Topic E Self-Test

A.

a) $8\,500 \div 100 = 85$ b) $3\,000 \div 30 = 100$ c) $26\,000 \div 200 = 130$

d) $3\,000 \div 60 = 50$ e) $2\,000 \div 20 = 100$ f) $12\,000 \div 60 = 200$

Topic F: Division Problems

Review the **Problem Solving Steps** in Book Two, Topic F.

One common type of division problem gives a total amount for **several** things and asks you to **find** what the amount would be for **one**.

Problems may tell you…	**and ask you to find…**
kilometres driven in 8 hours (h)	km driven in 1 h
cost for 15 kg (or litres, etc.)	cost for one kg
pay for 40 hours	pay for one hour
rent for one year (12 months)	rent for one month
work done in eight hours	work done in one hour
kilometres driven on 55 L of gas	km driven on 1 L of gas

The word *per* is a Latin word meaning "for each". For example, "Find the kilometres *per* hour" may be used to mean, "Find the kilometres driven in one hour." A slash (/) also means per e.g. km/h.

"Find the average" is another way of asking you to find the amount for one.

It may be difficult to decide which number is the dividend and which is the divisor. These suggestions should help:

- Look at the question in the problem. What do you have to find out? Look for the words "per" and "for one."

- How will the answer be written? That is your clue. If the answer is km/h then the division equation will be total km ÷ h. Study these examples:

  - total of kilometres ÷ number of hours = km/h
  - total of kilometres ÷ number of litres = km/L
  - total cost ÷ unit = cost per unit
  - total pay ÷ hours (or days, etc.) = pay per hour
  - total rent ÷ number of months = rent/month
  - total things done ÷ total time = number done/unit of time

- Do a quick estimate.

- Look at your estimate and re-read the problem. Does your answer make sense?

To **find the average**, divide the total amount by the number of items that make up the total. You may first have to add the different items together to find the total.

Average = Total amount ÷ number of items that make the total

Example A: You bowled 5 games with scores of 124, 187, 164, 205, 130. What was your average score?

Find the total by adding 124 + 187 + 164 + 205 + 130 = 810

Divide the total by number of items 810 ÷ 5 games = 162 per game

Example B: Joan and Rick have been keeping track of their household costs. They want to plan a monthly budget. Their grocery bills for six months were $428, $605, $397, $530, $590, and $474. What is their average monthly grocery cost?

Find the total amount.
$428 + $605 + $397 + $530 + $590 + $474 = $3 024

Divide total amount by number of items.
$3024 ÷ 6 = $504 average cost per month

Some Details to Remember

1 minute = 60 seconds

1 hour = 60 minutes

1 year = 365 days

1 year = 12 months

1 year = 52 weeks

Key Words That Point to DIVISION

Find the average	separated
Find the _____ per _____ .	split
Find the unit price	shared

Exercise One

Solve these problems. Use the five problem solving steps. Be sure to write down an estimate and check that the estimate makes sense **before** you find the actual solution. Check your work using the answer key at the end of the exercise.

a) A machine shop can stamp out 360 car parts in an 8 hour working day. How many parts is that per hour?

b) Izyan paid $560 for 4 tires. How much did each tire cost?

c) Bjork earned $8 840 in 4 months.

i) How much did he earn each month?

ii) How much did he earn per week? (4 months is 17 weeks)

d) Theron used 9 L of gasoline to drive 207 km. How many kilometres did he drive per litre?

e) The total cost of the car Elena bought is $14 880 including taxes and interest. She will pay for it in 24 equal payments. How much will each payment be?

f) Diego worked 8 hours a day for five days and earned $360. How much was he paid per hour? (This is a 2 step problem – you must first find the total number of hours.)

g) Dae-Hyun and Mi-Ok can afford no more than a total of $14 940 per year for rent, electricity, and phone. How much can they pay per month?

h) In four hours, Kamden cycled 64 km. What is his average speed in kilometers per hour?

i) Akbar drove 4 697 km on his 7 day trip across six provinces. What was the average number of kilometres that he drove each day?

j) The Scouts and Cubs collected 4 980 aluminum pop and beer cans on their fund raising “Bottle Drive”. They squashed the cans and packed them into 20 boxes. What is the average number of cans per box?

Answers to Exercise One

a)	45 parts per hour	b)	$140 per tire	c)	i) $2 210 per month,	ii)	$520 per week
d)	23 km/L	e)	$620 per payment	f)	$9 per hour	g)	$1 245 per month
h)	16 km/hr	i)	671 km/day	j)	249 cans per box		

A second type of division problem gives the total amount and the size of each group. You will find the number of groups. You will notice that **both numbers have the same units.** The **answer** to the problem **will give another unit.** This other unit will be asked for in the problem.

Example A: One necklace uses **125 beads**. How many necklaces can Susan make for the craft fair if she has **6 250 beads?**

Find how many groups of 125 there are in 6 520.

$6\,250 \div 125 =$ _____

$$\begin{array}{r} 50 \\ 125\overline{)6\,250} \\ \underline{6\,25} \\ 0 \end{array}$$

She can make **50 necklaces.**

Example B: If you drive an average speed of 80 km an hour, how many hours will it take you to drive 560 km?

Find how many groups of 80 km there are in 560 km.

$56\not{0} \div 8\not{0} = 7$

The 560 km trip will take 7 hours.

Exercise Two

Pay attention to wording and situations as you solve these problems. Use the five problem solving steps. Be sure to write down an estimate and check that the estimate makes sense **before** you find the actual solution. Check your work using the answer key at the end of the exercise.

a) A train travels 90 km per hour. How many hours will it take the train to go 540 km?

b) A car gets 16 km per litre of gasoline. How many litres will the car need to go 128 km?

c) About 8 m is needed for one parking space. How many parking spaces can be made along a street that is 232 m long?

d) If you spend an average of 8 minutes on one math problem, how many problems can you finish in one hour? Will you have any time left? How much?

e) The Skating Club members decided to sell home-made candy to raise money. The boxes they bought will hold 45 pieces of candy. If everyone makes a double batch of fudge they will have 2590 pieces of fudge. How many boxes can they fill? How many pieces of fudge are left-over for them to eat?

f) A class of 334 students is going to Victoria by bus. Each bus holds 43 passengers. How many buses do they need? Will there be any empty seats? (Be careful with this one!)

g) Steve Nash scores an average of 17 points per game. During the 2009-10 season, he scored 1 377 point in all. How many games did he play last season?

Answers to Exercise Two

a) 6 hours
b) 8 L
c) 29 parking spaces
d) 7 problems, yes, 4 min
e) 57 boxes, 25 pieces left over
f) 8 buses, 10 empty seats
g) 81 games

Unit Pricing

A unit price is the price for one of something. To find unit price, divide the total cost by the number of things bought.

Example A: 5 shirts cost $60

To find the cost per shirt, $60 ÷ 5 =

$$5\overline{)60}\quad 12$$

The unit price is $12.

Example B: 6 L of oil for $18

To find the cost per L, $18 ÷ 6 =

$$6\overline{)18}\quad 3$$

The unit price is $3.

Exercise One

Solve the cost per unit price. Check your work using the answer key at the end of the exercise.

a) 2 CDs for $26

b) 3 cans of dog food for $6

c) 4 air fresheners for $8

d) 2 cat treats for $4

e) 2 pizzas for $22

f) 2 cans of peanuts for $8

g) 2 ice cream for $12

h) 4 boxes of chocolate bars for $48

i) 2 WD-40 for $6

j) 3 paint rollers for $9

k) 4 tie downs for $20

l) 3 boxes of diapers for $51

m) 3 work shirts for $45

n) 8 pairs of socks for $64

Answers to Exercise One

a) $13	b) $2	c) $2	d) $2	e) $11	f) $4	g) $6
h) $12	i) $3	j) $3	k) $5	l) $17	m) $15	n) $8

Best Buy

The **best** buy is the **lowest unit price.**

Example A: 4 L of canola oil for $8 or 10 L of canola oil for $30

$\$8 \div 4 =$ $\$30 \div 10 =$

$4\overline{)8}\ 2$ $10\overline{)30}\ 3$

4L of canola oil for $8 is a better buy since the unit price is $2 per L, while 10 L for $30 has a unit price of $3 per L.

Exercise Two

Solve the unit price and then underline the best buy. Check your work using the answer key at the end of the exercise.

a) 2 L of engine oil for $8
5 L of engine oil for $15

b) 4 tires for $240
2 tires for $110

c) 6 jars of salad dressing for $24
3 jars of salad dressing for $15

d) 7 kg of dog food for $21
16 kg of dog food for $32

e) 3 DVDs for $54
7 DVDs for $119

f) 3 L of laundry soap for $6
17 L of laundry soap for $68

Answers to Exercise Two

a) $4, $3, 5 L for $15 b) $60, $55, 2 tires for $110 c) $4, $5, 6 salad dressing for $24

d) $3, $2, 16 kg for $32 e) $18, $17, 7 DVDs for $119 f) $2, $4, 3 L for $6

Topic F: Self-Test

Mark /12 **Aim 10/12**

A. Solve these problems. **12 marks**
2 marks each – 1 for correct method, 1 for correct solution.

a) Enrique drove the 1 920 km from Dease Lake to Creston in 24 hours. What was his average speed in kilometres per hour?

b) The Evergreen Company employs 26 people. Its total payroll for last month was $84 162. What was the average monthly pay cheque per person?

c) The proud gardener grew a total crop of 135 cucumbers on 15 plants. What was the average crop per plant?

d) In a recent truckload sale, electric stoves were sold for $432. The gross income from the stove sale was $42 336. How many stoves were sold?

e) The 39 farmers in Jones Valley had a total income last year of $2 905 500. What was their average income?

f) A store has an inventory (stock on hand) of chairs with a total value of $1 738. Each chair is to be sold at $79. How many of these chairs are there?

Answers to Topic F Self-Test

A.

a) 80 km/h	b) $3 237 per month	c) 9 cucumbers per plant
d) 98 stoves	e) $74, 500	f) 22 chairs

Topic G: Mixed Problems

Carefully read again the **Problem Solving Steps** in Book Two, Topic F or ask your instructor for a copy of those pages. Read the problems to help you *get a feel* for the wording and problem situations you can expect for addition, subtraction, multiplication, and division problems. Ask your instructor for a list of key words that will point to the operation you should choose.

Exercise One

Solve these problems using the five problem solving steps. Show your estimation and actual work. Write a sentence answer remembering to use the **units**. Check your work using the answer key at the end of the exercise.

a) Saika gave her students cinnamon hearts on Valentine's Day. She bought a box of 1 120 cinnamon hearts and gave each student 35 candies, using up the whole box. How many students does she have?

b) Each stamp cost 57 cents. Dolores bought 100 stamps. How much money did she spend on stamps (before taxes)?

c) Etienne planted 30 tomato plants in rows of 5 plants. How many rows did he plant?

d) There are 8 servings per large economy-size can of fruit. The restaurant ordered 5 cases with 24 cans per case. How many servings of fruit can the restaurant get from this order? (This is a two step problem – first find the total number of cans. Then find the number of servings.)

e) A train traveled 2 250 km at a speed of 75 km per hour. How many hours did the trip take?

f) The regular mountain bike costs $499 and the fancy model is $675. How much more do you pay for the fancy mountain bike?

g) The members of the Shiny Wheels Bicycle Club ride at an average speed of 16 km/h. On their weekend trip they rode 2 hours Friday night, 7 hours on Saturday, spent two hours soaking their aching bones at the Hot Springs, and then rode a final five hours on Sunday. How many kilometres did they ride on this weekend trip? (2 steps)

h) Last week Mrs. Sanderson drove 29 km on Monday, 42 km on Tuesday, 5 km on Wednesday, and 21 km on Friday. How far did she drive last week?

i) The Yeung family has an income of $4 232 per month. Their rent is $1 157. 00. How much do they have left after paying the rent?

j) Last year, Mr. Yee drove his car 87 240 km. What was his monthly average?

k) Davinder lives 6 blocks from school. She walks back and forth to school and also walks when she comes home for lunch every day.

i) How many blocks does Davinder walk on her trips to and from school in one day?

ii) How many blocks does she walk to and from school in one school week (5 days)?

l) The Bolshevik Revolution in 1917 saw the beginning of the Union of Soviet Socialist Republics (USSR). In 1991, the USSR crumbled and many of the republics broke away. How many years are there between the Bolshevik Revolution and the end of the USSR?

m) A plane travels 4 785 km in 11 hours. What is its average speed per hour?

n) The Marchettis are saving to buy cross-country skis for the family. The ski equipment will cost $1 275 altogether. Mrs. Marchetti has been saving $75 each month. At that rate of saving, how many months will it take before she can buy the skis?

o) A new play, which was 95 minutes long, was performed for 4 nights. A total of 3 368 people bought tickets to see it. What was the average nightly attendance?

p) The continent of North America is the home of three countries – Canada, the United States of America, and Mexico. The area of Canada is 9 984 670 square kilometres. The area of the USA is 9 629 091 square kilometres and the area of Mexico is 1 964 375 square kilometres. According to these figures, what is the total area of these three countries?

Answers to Exercise One

a) 32 students	b) $57.00	c) 6 rows
d) 960 servings	e) 30 hours	f) $176 more
g) 224 km	h) 97 km	i) $3 075
j) 7 270 km per month	k) i) 24 blocks, ii) 120 blocks	l) 74 years
m) 435 km/h	n) 17 months	o) 842 people
p) 21 578 136 square kilometres		

Unit 3 Review - Division

You will now practice all the skills you learned in Unit 3. Check your work using the answer key at the end of the review.

A. Complete this chart.

	Multiplication	**Division**	**Division**	**"Say"**
a)	*5 × 3 = 15* *3 × 5 = 15*	*15 ÷ 3 = 5* *15 ÷ 5 = 3*	$3\overline{)15}$ $\;5$ $5\overline{)15}$ $\;3$	*15 divided by 3 is 5.* *15 divided by 5 is 3.*
b)	3 × 6 = 18			
c)	3 × 7 = 21			
d)	5 × 9 = 45			

B. Give the answer.

a) 56 ÷ 7 =

b) 40 ÷ 8 =

c) 54 ÷ 9 =

d) $6\overline{)42}$

e) $9\overline{)72}$

f) $8\overline{)32}$

C. Find the quotients.

a) $7\overline{)68}$

b) $4\overline{)29}$

c) $5\overline{)24}$

d) $6\overline{)53}$

D. Put a check mark for each number that divides evenly.

	Number	2	3	5	9
a	135				
b	384				
c	4 614				
d	495				
e	648				
f	745				

E. Find the quotients.

a) $8\overline{)296}$

b) $6\overline{)252}$

c) $4\overline{)732}$ d) $5\overline{)175}$

F. Find the quotients.

a) $3\overline{)86}$ b) $4\overline{)97}$

c) $2\overline{)71}$ d) $5\overline{)59}$

G. Find the quotients.

a) $7\overline{)615}$ b) $2\overline{)647}$

c) $3\overline{)781}$ d) $9\overline{)839}$

H. Find the quotients.

a) $8\ 956 \div 42 =$

b) $32\overline{)832}$

c) $69\ 140 \div 56 =$

d) $312\overline{)9\ 984}$

e) $41\ 082 \div 334 =$

f) $781\overline{)39\ 752}$

g) $275\overline{)55\ 661}$

h) $307\overline{)91\ 838}$

I. Find the quotients.

a) $1\,000\overline{)38\,645}$

b) $18\,592 \div 100 =$

c) $4\,923 \div 10 =$

d) $100\overline{)17\,342}$

J. Quickly find the quotients. Remember to cancel the <u>same number</u> of zeros in both the divisor and dividend in each question.

a) $200\overline{)50\,000}$

b) $6\,000\overline{)360\,000}$

c) $40\,000\overline{)1\,600\,000}$

d) $70\,000\overline{)6\,300\,000}$

K. Give an estimated quotient. Show your rounding.

a) $37\overline{)15\ 725}$

b) $54\overline{)8\ 478}$

c) $768\overline{)63\ 721}$

d) $6\ 267\overline{)536\ 497}$

L. Word Problems.

a) At the Kaizen Factory, 14 325 cars were put together in 5 days. Each day the same number of cars were built. How many cars were built each day?

b) The Blaster Rubber Company needs to make 6 912 hockey pucks. Mr. Frost, the foreman, says that their machines can make the pucks in 12 hours. How many pucks would be made in one hour?

c) The distance between Fort St. John and Kimberley is 1 092 km. What was your average speed if the trip took 12 hours?

d) The new stadium has 15 981 seats divided evenly into 76 sections. Estimate how many seats are in each section?

M. Solve the cost per unit price.

a) 4 rolls of hockey tape for $8

b) 4 cans of butane fuel for $12

N. Solve the unit price and then underline the best buy.

a) 2 L of antifreeze for $6
5 L of antifreeze for $10

b) 8 kilograms of bird seed for $16
4 kilograms of bird seed for $12

O. Word Problems.

a) The bakery uses 43 kilograms of butter in each batch of shortbread cookies. How many batches of shortbread can be made from 3 569 kilograms of butter?

b) Each crate that the men unloaded weighed 175 kilograms. If they unloaded 232 crates, how many kilograms did they unload?

c) The parts factory produced 4 173 less parts this month than last month. The factory produced 49 736 parts this month. How many parts did the factory produce last month?

d) Three Eastjet jets were flown 24 826 kilometres, 9 423 kilometres and 56 015 kilometres. What is the total kilometres the three jets were flown?

Answers to Unit 3 Review

A.

	Multiplication	Division	Division	"Say"
a)	$5 \times 3 = 15$ $3 \times 5 = 15$	$15 \div 3 = 5$ $15 \div 5 = 3$	$3\overline{)15}\ 5$ $5\overline{)15}\ 3$	*15 divided by 3 is 5* *15 divided by 5 is 3*
b)	$3 \times 6 = 18$ $6 \times 3 = 18$	$18 \div 6 = 3$ $18 \div 3 = 6$	$6\overline{)18}\ 3$ $3\overline{)18}\ 6$	*18 divided by 3 is 6.* *18 divided by 6 is 3.*
c)	$3 \times 7 = 21$ $7 \times 3 = 21$	$21 \div 7 = 3$ $21 \div 3 = 7$	$7\overline{)21}\ 3$ $3\overline{)21}\ 7$	*21 divided by 7 is 3.* *21 divided by 3 is 7.*
d)	$5 \times 9 = 45$ $9 \times 5 = 45$	$45 \div 9 = 5$ $45 \div 5 = 9$	$9\overline{)45}\ 5$ $5\overline{)45}\ 9$	*45 divided by 9 is 5.* *45 divided by 5 is 9.*

B.

a) 8 b) 5 c) 6 d) 7 e) 8 f) 4

C.

a) 9 R5 b) 7 R1 c) 4 R4 d) 8 R5

D.

	Number	2	3	5	9
a	135		√	√	√
b	384	√	√		
c	4 614	√	√		
d	495		√	√	√
e	648	√	√		√
f	745			√	

E.

a) 37 b) 42 c) 183 d) 35

F.

a) 28 R2 b) 24 R1 c) 35 R1 d) 11 R4

G.

a) 87 R6 b) 323 R1 c) 260 R1 d) 93 R2

H.

a) 213 R10 b) 26 c) 1 234 R36 d) 32

e) 123 f) 50 R702 g) 202 R111 h) 299 R45

I.

a) 38 R645 b) 185 R92 c) 492 R3 d) 173 R42

e) 38 R645 f) 185 R92

J.

a) 250 b) 60 c) 40 d) 90

K.

a) 16 000 ÷ 40 = 400 b) 8 500 ÷ 50 = 170

c) 64 000 ÷ 800 = 80 d) 540 000 ÷ 6 000 = 90

L.

a) 2 865 cars/day b) 576 pucks/h

c) 91 hours d) 16 000 ÷ 80 = 200 seats/section

M.

a) $2 b) $3

N.

a) $3, $2, 5 L of antifreeze for $10 b) $2, $3, 8 kilograms of bird seed for $16

O.

a) 83 batches b) 40 600 kilograms c) 53 909 parts d) 90 264 kilometres

CONGRATULATIONS!!

Now you have finished Unit 3.

TEST TIME!

Ask your instructor for the Practice Test for this unit.
Once you've done the practice test,
you need to do the unit 3 test.
Again, ask your instructor for this.
Good luck!