Division

WORKSHEETS

Mental division strategies – inverse operations

As we know, multiplication and division are inverse operations.
This means they do the reverse of each other:

$8 \times 9 = 72$
$72 \div 9 = 8$

We can use our knowledge of the times tables to help us answer division questions.

1 Complete these fact families:

a $8 \times \boxed{} = 24$

   $24 \div 8 = \boxed{}$

b $8 \times \boxed{} = 32$

   $32 \div 8 = \boxed{}$

c $7 \times \boxed{} = 42$

   $42 \div 7 = \boxed{}$

d $9 \times \boxed{} = 27$

   $27 \div 9 = \boxed{}$

e $5 \times \boxed{} = 25$

   $25 \div 5 = \boxed{}$

f $8 \times \boxed{} = 96$

   $96 \div 8 = \boxed{}$

2 Use your knowledge of multiplication to help you mentally solve these problems. Some will have remainders.

a $36 \div 3 = \boxed{}$

b $63 \div 7 = \boxed{}$

c $121 \div 11 = \boxed{}$

d $120 \div 10 = \boxed{}$

e $25 \div 6 = \boxed{}$

f $37 \div 8 = \boxed{}$

g $68 \div 11 = \boxed{}$

h $113 \div 12 = \boxed{}$

> **What do we do when there are remainders? We have to guess, check, and improve.**
>
> **$27 \div 5 = ?$**
>
> **$5 \times 6 = 30$ Too high**
>
> **$4 \times 5 = 20$ Too low, there are 7 left over**
>
> **$5 \times 5 = 25$ There are 2 left over so $27 \div 5 = 5 \text{ r } 2$**

3 Try these:

a 42 cupcakes are shared evenly among you and 7 friends. How many whole cakes does each person receive?

b How do you recommend sharing the remainder?

THINK

c 102 pencils need to be put into packets of 12. How many full packs can be made? How many pencils are left over?

Mental division strategies – split strategy

Division problems become easier if you split the number to be divided into recognizable facts.

Look at the problem 68 ÷ 2

Can we divide 68 into 2 multiples of 2?

One option is 60 and 8. These are both easily divided by 2.
We do this, then we add the two answers together.

$$68 ÷ 2$$

60	8
÷ 2	÷ 2
30 +	4 = 34

Or, with two even numbers, we can keep halving until we get to known number facts:

256 ÷ 64 → 128 ÷ 32 → 64 ÷ 16 → 32 ÷ 8 = 4

1 **Use the split strategy to divide these numbers:**

a   112 ÷ 8

_80_   _32_

÷ 8   ÷ 8

_____ + _____ = [   ]

b   115 ÷ 5

_____   _____

÷ 5   ÷ 5

_____ + _____ = [   ]

c   102 ÷ 6

_____   _____

÷ 6   ÷ 6

_____ + _____ = [   ]

2 **Choosing a strategy, solve these problems. Try and do them in your head.**

a 68 ÷ 16 = [   ]

b 284 ÷ 4 = [   ]

c 126 ÷ 2 = [   ]

d 168 ÷ 8 = [   ]

e 196 ÷ 2 = [   ]

f 744 ÷ 12 = [   ]

> You can also make notes as you go, as in the example above!

3 **Choose a strategy and solve these:**

a 848 packs of Smarties are thrown into the audience at an end of year school concert. If the teachers bought enough Smarties for each child to receive 8, how many audience members are there?

b Your class of 24 ended up doing extremely well at the Smartie toss. Not only were you positioned well, you had a "show no mercy" approach which resulted in the class scoring 216 of the Smarties. On average, how many was this per student?

c After the concert, your class feels bad that you squashed so many kindergarteners in your quest for the Smarties. You decide to give 90 of them to the 18 little ones. How many does each kindergartener get?

Mental division strategies – using factors

Factors are numbers you multiply together to get to another number:

(factor) × (factor) = (whole number)

Knowing the factors of numbers is helpful when solving multiplication and division problems.

1 **Complete these factor activities:**

a List all the factors of the following numbers. The first one has been done for you.

36	1, 36, 2, 18, 3, 12, 4, 9, 6
45	
72	
144	
100	
48	
64	

b Generate 2 sets of factors for each number. The first one has been done for you.

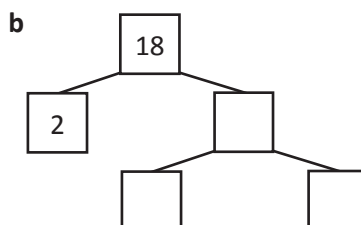| 64	8 × 8	32 × 2
42		
24		
90		
120		
132		
240		

Factor trees help us work out the factorization of numbers. Prime factors are the factors that can be divided no further, except by themselves and one.

2 **Practice prime factorization by completing these factor trees:**

a

50
5

____ × ____ × ____ = 50

b

18
2

____ × ____ × ____ = 18

c

16
4
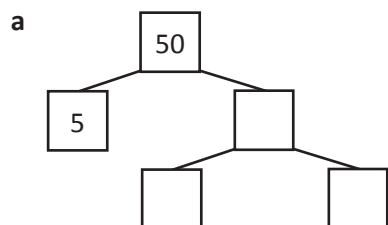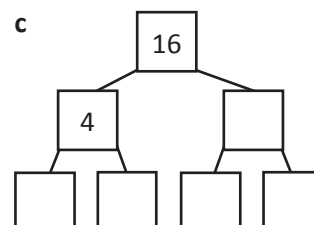
___ × ___ × ___ × ___ = 16

3 **Find the answer to these:**

a What are the common factors of 24 and 60?

b What is the greatest common factor (GCF) of 75 and 125?

c What is the greatest common factor of 36 and 63?

Mental division strategies – using factors

When we are dividing by 2 digit numbers we can split the divisor into two factors. This makes the problem easier. Then we do the division in two steps:

$216 \div 18$	9 and 2 are factors of 18.
$216 \div 2 = 108$	We divide 216 by 2.
$108 \div 9 = 12$	We then divide 108 by 9.
$216 \div 18 = 12$	

4 **For each problem, find a pair of factors you can work with and solve these problems:**

a $564 \div 12$

$\boxed{} \div \boxed{} = \boxed{}$

$\boxed{} \div \boxed{} = \boxed{}$

$= \boxed{}$

b $126 \div 14$

$\boxed{} \div \boxed{} = \boxed{}$

$\boxed{} \div \boxed{} = \boxed{}$

$= \boxed{}$

c $330 \div 15$

$\boxed{} \div \boxed{} = \boxed{}$

$\boxed{} \div \boxed{} = \boxed{}$

$= \boxed{}$

d $918 \div 18$

$\boxed{} \div \boxed{} = \boxed{}$

$\boxed{} \div \boxed{} = \boxed{}$

$= \boxed{}$

5 **These problems have been worked out already but there are 2 wrong answers. Mark the ones that have been worked out correctly. If errors have been made, circle where it all began to go wrong:**

> Check each line carefully! It's OK to make notes as you go.

a $192 \div 12 = 16$

3 and 4 are factors of 12

$192 \div 4 = 48$

$48 \div 3 = 16$

b $288 \div 24 = 24$

2 and 6 are factors of 24

$288 \div 6 = 48$

$48 \div 2 = 24$

c $280 \div 40 = 56$

5 and 8 are factors of 40

$280 \div 8 = 35$

$280 \div 5 = 57$

d $510 \div 30 = 17$

3 and 10 are factors of 30

$510 \div 10 = 51$

$51 \div 3 = 17$

Mental division strategies – divisibility rules

Divisibility tests tell us if a number can be divided evenly by another, with no remainder.

These are handy rules to know:

2   A number can be divided by 2 if the ones digit is even.

4   A number can be divided by 4 if the last 2 digits form a number that can be divided by 4.

5   A number can be divided by 5 if the ones digit is 0 or 5.

10   A number can be divided by 10 if the number ends in a zero.

100   A number can be divided by 100 if the number ends in 2 zeros.

6   A number can be divided by 6 if it is divisible by both 2 and 3.

3   A number can be divided by 3 if you add all the digits and the sum is divisible by 3.

9   A number can be divided by 9 if you add all the digits and the sum is divisible by 9.

1   **Test these rules. Circle the numbers that match the stated rule.**

a

Divisible by 2
432
235
628
900
12,562

b

Divisible by 5
350
75
5,556
34,512
17,890

c

Divisible by 4
3,432
5,208
359
6,256
32,547

d

Divisible by 10
4,560
83,210
8,436
187,490
11,609

e

Divisible by 3
36
932
3,561
22,468
13,906

f

Divisible by 100
4
570
26,730
459,800
934,600

2   **Each of the numbers below has one or more missing digits. Add the digits needed to make the statements true. For some of the numbers, more than one choice of digit would work.**

a   54____   is divisible by 4.

b   2,____ ____5   is divisible by 9.

c   2,35____   is divisible by 3.

d   3,4____0   is divisible by 6.

e   45,67____   is divisible by 10.

f   678,9____ ____ is divisible by 100.

g   156,85____   is divisible by 6.

h   5,4____ ____   is divisible by 5.

Mental division strategies – dividing by multiples of ten

Dividing a whole number by 10 makes it smaller by one place value: **80 ÷ 10 = 8**

Dividing by 100 makes a number smaller by 2 place values: **80 ÷ 100 = 0.8**

Dividing by 1,000 makes it smaller by three place values: **80 ÷ 1,000 = 0.08**

1 **Solve these problems by moving the appropriate number of place values:**

a 550 ÷ 10   = ☐

b 550 ÷ 100   = ☐

c 550 ÷ 1,000   = ☐

d 12,000 ÷ 10 = ☐

e 12,000 ÷ 100 = ☐

f 12,000 ÷ 1,000 = ☐

g 126 ÷ 10   = ☐

h 126 ÷ 100   = ☐

i 126 ÷ 1,000   = ☐

We divide by a multiple of 10 such as 20 or 40 in two parts. Look at **480 ÷ 40**:

480 ÷ 10 ÷ 4 = 12   OR   **480 ÷ 4 ÷ 10** = 12

2 **Solve these problems:**

a 270 ÷ 30

270 ÷ 10 ÷ 3   = ☐

b 550 ÷ 50

550 ÷ 10 ÷ 5   = ☐

c 840 ÷ 20

840 ÷ 10 ÷ 2   = ☐

d 8,000 ÷ 40

8,000 ÷ 10 ÷ 4 = ☐

e 9,000 ÷ 30

9,000 ÷ 10 ÷ 3 = ☐

f 12,000 ÷ 200

12,000 ÷ 100 ÷ 2 = ☐

3 **Use doubling or repeat doubling to help you get to an easier problem:**

> Doubling is a useful strategy to use to get me to multiples of ten. Look at 225 ÷ 5.
>
> If I double both numbers I can divide 450 by 10. Much easier!

a 625 ÷ 5   = ☐ ÷ ☐ = ☐

b 275 ÷ 5   = ☐ ÷ ☐ = ☐

c 1,250 ÷ 5 = ☐ ÷ ☐ = ☐

d 450 ÷ 25 = ☐ ÷ ☐ = ☐ ÷ ☐ = ☐

e 850 ÷ 25 = ☐ ÷ ☐ = ☐ ÷ ☐ = ☐

THINK

Long division

The problem 824 divided by 5 can be solved using long division. Long division contains four steps:
1. Divide 2. Multiply 3. Subtract 4. Bring down.

$$
\begin{array}{r}
1 \quad 6 \quad 4 \quad r\,4 \\
5\,)\overline{8 \quad 2 \quad 4} \\
-\ 5 \\
\overline{3 \quad 2} \\
-\ 3 \quad 0 \\
\overline{2 \quad 4} \\
-\ 2 \quad 0 \\
\overline{4}
\end{array}
$$

1. Divide: $5\,)\,8 = 1$
2. Multiply: $5 \times 1 = 5$
3. Subtract: $8 - 5 = 3$
4. Bring down: the 2 comes down, forming 32, and begins the process again. Now you have a new division problem $5\,)\,32$

1. Divide: $5\,)\,32 = 6$
2. Multiply: $6 \times 5 = 30$
3. Subtract: $32 - 30 = 2$
4. Bring down the 4 to create 24 and a new division problem $5\,)\,24$

1. Divide: $5\,)\,24 = 4$
2. Multiply: $5 \times 4 = 20$
3. Subtract: $24 - 20 = 4$
4. Bring down: there is nothing more to bring down so 4 is your remainder. So we write "r 4" after the whole number.

1 **Warm-up with these:**

a

$$5\,)\,\overline{6\quad 3} \qquad r$$

b

$$5\,)\,\overline{9\quad 9} \qquad r$$

c

$$4\,)\,\overline{7\quad 9} \qquad r$$

Long division

2 **Divide these 3-digit numbers:**

a 5) 7 1 8 r

b 3) 6 2 7 r

c 6) 6 1 1 r

d 8) 9 2 9 r

e 4) 6 3 5 r

f 4) 8 1 9 r

> **Mnemonic devices allow you to remember important information:**
>
> **D**ad **M**om **S**ister **B**rother can help you remember the order of long division:
>
> **D**ivide **M**ultiply **S**ubtract **B**ring down

THINK

Long division

3 **Look at these word problems and decide if they are asking you to divide. If they are, solve the problem. If not, name the process you would use to solve them:**

   a 250 kids go to the local pool on a hot summer's day. Each kid dives off the diving board 9 times. How many dives are there altogether?

   b The lifeguards come to the pool and hand out 750 free balloons. How many kids are there if they each get 3?

   c The ice cream shop is packed and sells 121 ice creams before lunch and 145 after lunch. How many ice creams do they sell in total?

Long division

d Of the 925 kids at the pool, one fifth are planning to come back the next day.
How many are coming back?

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4 **The mnemonic device Dad, Mom, Sister, Brother helps us remember the steps of long division. Can you write your own mnemonic device for long division?**