



MATHEMATICS



N.S. Yr. 5 P.61

**Using related facts and doubling and halving.
Use Factors.**

Equipment

Paper, pencil, calculator.

MathSphere

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Concepts

This module is concerned with using facts about doubling and halving to simplify sums and aid in calculating the answers.

Types of problems covered:

To double 87, double 80 and then double 7.

To multiply by a number ending in 5, double the number ending in 5 and halve the other number. Eg. $25 \times 16 = 50 \times 8 = 400$

To multiply by an even number, halve the even number, multiply and double the answer. Eg. 15×12 . Make this 15×6 and double the answer.

To multiply by 50, multiply by 100 by shifting digits and then halve.

Double the facts of one multiplication table to another twice as large. Eg. double 8 times table to obtain 16 times table.

Given one lot of a number is the number itself, obtain values for $2\times$, $4\times$ etc by doubling.

Use combinations of facts to obtain more complex answers.

Eg. $44 \times 21 = (44 \times 16) + (44 \times 4) + (44 \times 1)$

Use halving simpler fractions of numbers to calculate harder fractions of numbers. Eg. Find $\frac{1}{6}$ of 360. First find $\frac{1}{3}$ of 360 and then halve the answer. Similarly with twentieths etc.

Use factors to help in multiplication and division sums.

Eg. $23 \times 21 = 23 \times 3 \times 7 = 69 \times 7 = 483$

Eg. $96 \div 12 = 96 \div 2 \div 2 \div 3 = 48 \div 2 \div 3 = 24 \div 3 = 8$

As much of this work as possible should be done mentally, but some will have to be done on paper or the results recorded on paper, even if the working is done mentally.



If we want to double a number such as **87**, we can double the **80** and then double the **7**.

1. Try doubling these numbers using this idea:

a. 56 b. 45 c. 27 d. 84 e. 43 f. 39 g. 55 h. 62

2. Try doubling these more difficult numbers using this idea:

a. 96 b. 88 c. 67 d. 95 e. 58 f. 77 g. 93 h. 47

We can do the same thing with halving.
Half of **464** is:
half of **400** add half of **60** add half of **4**.
 $= 200 + 30 + 2$
 $= 232$



3. Try halving these numbers using this idea:

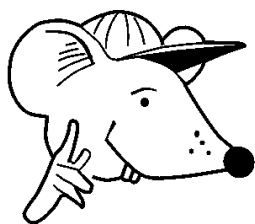
a. 444 b. 264 c. 856 d. 486 e. 476 f. 904 g. 428 h. 664

4. Try halving these more difficult numbers using this idea:

a. 294 b. 476 c. 364 d. 298 e. 456 f. 254 g. 746 h. 272

5. Using these ideas, see how quickly you can work out these little beauties!

a. 46×2 b. 53×2 c. $726 \div 2$ d. 48×2 e. $632 \div 2$ f. $854 \div 2$
g. 26×2 h. 47×2



Don't forget, if we want to double a number such as **68**, we can double the **60** and then double the **8**.

1. Try doubling these numbers using this idea:

a. 42 b. 52 c. 64 d. 85 e. 36 f. 75 g. 56 h. 34

2. Try doubling these more difficult numbers using this idea:

a. 74 b. 58 c. 76 d. 63 e. 86 f. 95 g. 75 h. 88

We can do the same thing with halving.
Half of **586** is:
half of **500** add half of **80** add half of **6**.
 $= 250 + 40 + 3$
 $= 293$



3. Try halving these numbers using this idea:

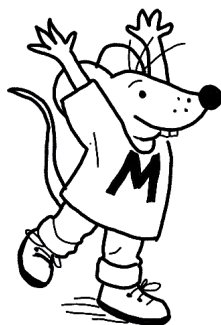
a. 642 b. 468 c. 234 d. 436 e. 638 f. 854 g. 920 h. 564

4. Try halving these more difficult numbers using this idea:

a. 546 b. 238 c. 474 d. 566 e. 964 f. 474 g. 834 h. 532

5. Using these ideas, see how quickly you can work out these little beauties!

a. 85×2 b. 64×2 c. $640 \div 2$ d. 77×2 e. $864 \div 2$ f. $956 \div 2$
g. 39×2 h. 27×2



When we are multiplying by a number ending in **5**, we can double this number and halve the other before multiplying:

26×35 is: 13×70

That comes to **910**. Amazing!

1. Multiply these numbers using this idea:

a. 26×45 b. 14×25 c. 38×5 d. 18×25 e. 28×35 f. 18×15

2. Now try multiplying these harder numbers using the same idea:

a. 54×35 b. 44×35 c. 62×45 d. 26×45 e. 56×25 f. 42×35

If one number in a multiplication sum is even, we can halve it, multiply and double the answer.

Eg. 23×18 . Halve **18** and do the sum $23 \times 9 = 207$.

Now double the answer \longrightarrow **414**.

3. a. 14×15 b. 22×13 c. 25×12 d. 19×8 e. 35×14 f. 16×25

4. a. 12×16 b. 17×14 c. 35×16 d. 27×12 e. 48×8 f. 23×16

To multiply a number by **50**, multiply by **100** and then halve the answer.

Eg. 24×50 . Work out $24 \times 100 = 2\,400$.

Now halve the answer. $2\,400 \div 2 = 1\,200$

5. a. 32×50 b. 28×50 c. 50×44 d. 50×26 e. 42×50 f. 50×94

6. a. 46×50 b. 15×50 c. 50×23 d. 50×76 e. 36×50 f. 50×84



When we are multiplying by a number ending in **5**, we can double this number and halve the other before multiplying:
 48×15 is: 24×30
That comes to **720**. Amazing!

1. Multiply these numbers using this idea:

a. 34×15 b. 26×5 c. 46×15 d. 22×35 e. 36×15 f. 24×15

2. Now try multiplying these harder numbers using the same idea:

a. 46×25 b. 62×25 c. 40×35 d. 54×15 e. 46×35 f. 64×25

If one number in a multiplication sum is even, we can halve it, multiply and double the answer.

Eg. **31×16** . Halve **16** and do the sum **$31 \times 8 = 248$** .

Now double the answer **$\longrightarrow 496$** .

3. a. 16×23 b. 18×17 c. 41×14 d. 21×12 e. 45×16 f. 22×17

4. a. 13×16 b. 13×14 c. 27×16 d. 17×12 e. 31×8 f. 35×16

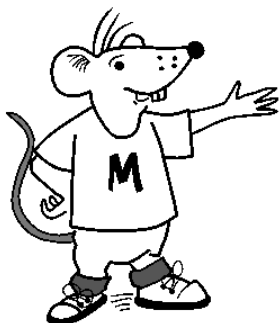
To multiply a number by **50**, multiply by **100** and then halve the answer.

Eg. **36×50** . Work out **$36 \times 100 = 3\,600$** .

Now halve the answer. **$3\,600 \div 2 = 1\,800$**

5. a. 26×50 b. 32×50 c. 50×28 d. 50×42 e. 18×50 f. 50×56

6. a. 64×50 b. 37×50 c. 50×19 d. 50×72 e. 83×50 f. 50×62



We can use **factors** to develop the ideas we have been looking at.

Yes! If we want to **multiply** by 6, we can multiply by 3 and then by 2 (double).

$$\begin{aligned}\text{Eg. } 23 \times 6 &= 23 \times 3 \times 2 \\ &= 69 \times 2 \\ &= 138\end{aligned}$$

1. Try multiplying these numbers using **factors**:

- a. 17×6 b. 22×14 c. 32×6 d. 23×10
e. 90×15 f. 29×6 g. 41×8 h. 22×22



2. Try multiplying these more difficult numbers using **factors**:
(Use a calculator for the multiplication part)

- a. 37×35 b. 26×77 c. 57×21 d. 31×38
e. 24×35 f. 51×15 g. 43×24 h. 49×21

We can do something similar with **division**.
If we want to divide by 6, we can divide by 3
and then divide by 2.

$$\text{Eg. } 78 \div 6 = 78 \div 3 \div 2 = 13$$



3. Try dividing these sums using **factors**:

- a. $24 \div 6$ b. $400 \div 10$ c. $90 \div 6$ d. $48 \div 8$ e. $64 \div 16$ f. $72 \div 12$

If you have mastered this, it must be time for a rest!





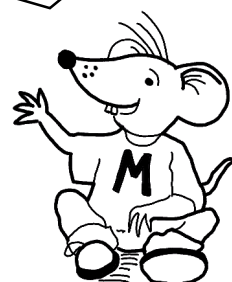
We can use **factors** to develop the ideas we have been looking at.

Yes! If we want to **multiply** by **15**, we can multiply by **3** and then by **5**.

$$\begin{aligned}\text{Eg. } 14 \times 15 &= 14 \times 3 \times 5 \\ &= 42 \times 5 \\ &= 210\end{aligned}$$

1. Try multiplying these numbers using **factors**:

- a. 22×6 b. 15×8 c. 32×15 d. 30×12
e. 24×15 f. 18×6 g. 33×10 h. 17×14



2. Try multiplying these more difficult numbers using **factors**:
(Use a calculator for the multiplication part)

- a. 23×21 b. 32×55 c. 64×16 d. 35×35
e. 52×24 f. 45×21 g. 27×18 h. 43×28

We can do something similar with **division**.
If we want to divide by **9**, we can divide by **3**
and then divide by **3**.

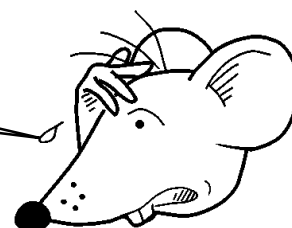
$$\text{Eg. } 108 \div 9 = 108 \div 3 \div 3 = 12$$



3. Try dividing these sums using **factors**:

- a. $28 \div 14$ b. $56 \div 14$ c. $126 \div 6$ d. $117 \div 9$ e. $66 \div 6$ f. $84 \div 12$

I hope you have understood all this.
Good fun, isn't it!



1. Write down the **four** times table in the **first** column.



I hope you have been learning your tables.

$1 \times 4 = 4$	$1 \times 8 =$	$1 \times 16 =$
$2 \times 4 =$	$2 \times 8 =$	$2 \times 16 =$
$3 \times 4 =$	$3 \times 8 =$	$3 \times 16 =$
$4 \times 4 =$	$4 \times 8 =$	$4 \times 16 =$
$5 \times 4 =$	$5 \times 8 =$	$5 \times 16 =$
$6 \times 4 =$	$6 \times 8 =$	$6 \times 16 =$
$7 \times 4 =$	$7 \times 8 =$	$7 \times 16 =$
$8 \times 4 =$	$8 \times 8 =$	$8 \times 16 =$
$9 \times 4 =$	$9 \times 8 =$	$9 \times 16 =$
$10 \times 4 =$	$10 \times 8 =$	$10 \times 16 =$

I have!

Now fill in the second and third columns by doubling and doubling again.

2. We can use the doubling method to work out big sums.

How far can you go with these patterns?

$$1 \times 15 = 15$$

$$1 \times 18 = 18$$

$$2 \times 15 =$$

$$2 \times 18 =$$

$$4 \times 15 =$$

$$4 \times 18 =$$

$$8 \times 15 =$$

$$8 \times 18 =$$

$$16 \times 15 =$$

$$16 \times 18 =$$

$$32 \times 15 =$$

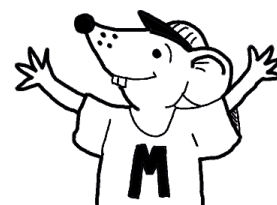
$$32 \times 18 =$$

$$64 \times 15 =$$

$$64 \times 18 =$$

1. Write down the **seven** times table in the **first** column.

You should keep practising those tables!



$1 \times 7 = 7$	$1 \times 14 =$	$1 \times 28 =$
$2 \times 7 =$	$2 \times 14 =$	$2 \times 28 =$
$3 \times 7 =$	$3 \times 14 =$	$3 \times 28 =$
$4 \times 7 =$	$4 \times 14 =$	$4 \times 28 =$
$5 \times 7 =$	$5 \times 14 =$	$5 \times 28 =$
$6 \times 7 =$	$6 \times 14 =$	$6 \times 28 =$
$7 \times 7 =$	$7 \times 14 =$	$7 \times 28 =$
$8 \times 7 =$	$8 \times 14 =$	$8 \times 28 =$
$9 \times 7 =$	$9 \times 14 =$	$9 \times 28 =$
$10 \times 7 =$	$10 \times 14 =$	$10 \times 28 =$

Now fill in the second and third columns by doubling and doubling again.

2. We can use the doubling method to work out big sums.

How far can you go with these patterns?

$$1 \times 13 = 13$$

$$1 \times 27 = 27$$

$$2 \times 13 =$$

$$2 \times 27 =$$

$$4 \times 13 =$$

$$4 \times 27 =$$

$$8 \times 13 =$$

$$8 \times 27 =$$

$$16 \times 13 =$$

$$16 \times 27 =$$

$$32 \times 13 =$$

$$32 \times 27 =$$

$$64 \times 13 =$$

$$64 \times 27 =$$

1. Look at this table:

$$1 \times 25 = 25$$

$$2 \times 25 = 50$$

$$4 \times 25 = 100$$

$$8 \times 25 = 200$$

$$16 \times 25 = 400$$

From this we can work out other multiples of **25**.

I hope you are not
feeling sleepy!



If we want to work out 22×25 , we should notice that **22** is $16 + 4 + 2$.

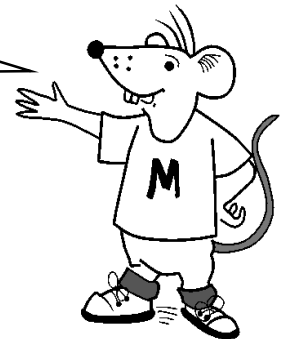
So, 22×25 is $(16 \times 25) + (4 \times 25) + (2 \times 25)$

How's it going?

From the table, we can see that:

$$16 \times 25 = 400, 4 \times 25 = 100 \text{ and } 2 \times 25 = 50.$$

$$\text{So } 22 \times 25 = 400 + 100 + 50 = 550$$



Now, you try this method with these sums.

The first has been done for you.

a. $7 \times 25 = (4 \times 25) + (2 \times 25) + (1 \times 25) = 100 + 50 + 25 = 175$

b. $6 \times 25 =$

c. $18 \times 25 =$

d. $31 \times 25 =$

We can find a sixth of a number by halving a third of it.

Eg. A third of **54** is **18**.

Half of **18** is **9**

So a sixth of **54** is **9**.



1. Use this method to find a **sixth** of these numbers:

a. 330 b. 72 c. 240 d. 1 200 e. 900 f. 630 g. 21 h. 33

2. Now use the same method to find a **sixth** of these harder numbers:

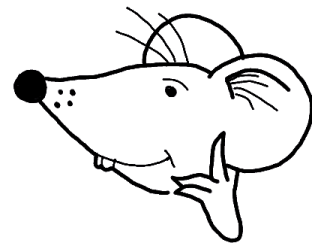
a. 990 b. 720 c. 540 d. 51 e. 249 f. 87 g. 99 h. 162

We can find a **twentieth** of a number by dividing by ten and halving the answer.

Eg. A tenth of **800** is **80**.

Half of **80** is **40**

So a twentieth of **800** is **40**.



3. Use this method to find a twentieth of these numbers:

a. 100 b. 160 c. 300 d. 240 e. 700 f. 460 g. 320 h. 180

4. Now use the same method to find a twentieth of these harder numbers:

a. 250 b. 480 c. 90 d. 560 e. 780 f. 550 g. 290 h. 8

Answers

Page 3

1. a. 112 b. 90 c. 54 d. 168 e. 86 f. 78 g. 110 h. 124
2. a. 192 b. 176 c. 134 d. 190 e. 116 f. 154 g. 186 h. 94
3. a. 222 b. 132 c. 428 d. 243 e. 238 f. 452 g. 214 h. 332
4. a. 147 b. 238 c. 182 d. 149 e. 228 f. 127 g. 373 h. 136
5. a. 92 b. 106 c. 363 d. 96 e. 316 f. 427 g. 52 h. 94

Page 4

1. a. 84 b. 104 c. 128 d. 170 e. 72 f. 150 g. 112 h. 68
2. a. 148 b. 116 c. 152 d. 126 e. 172 f. 190 g. 150 h. 176
3. a. 321 b. 234 c. 117 d. 218 e. 319 f. 427 g. 460 h. 282
4. a. 273 b. 119 c. 237 d. 283 e. 482 f. 237 g. 417 h. 266
5. a. 170 b. 128 c. 320 d. 154 e. 432 f. 478 g. 78 h. 54

Page 5

1. a. 1 170 b. 350 c. 190 d. 450 e. 980 f. 285
2. a. 1 890 b. 1 540 c. 2 790 d. 1 170 e. 1 400 f. 1 470
3. a. 210 b. 286 c. 300 d. 152 e. 490 f. 400
4. a. 192 b. 238 c. 560 d. 324 e. 384 f. 368
5. a. 1 600 b. 1 400 c. 2 200 d. 1 300 e. 2 100 f. 4 700
6. a. 2 300 b. 750 c. 1 150 d. 3 800 e. 1 800 f. 4 200

Page 6

1. a. 510 b. 130 c. 690 d. 770 e. 540 f. 360
2. a. 1 150 b. 1 550 c. 1 400 d. 810 e. 1 610 f. 1 600
3. a. 368 b. 306 c. 574 d. 252 e. 720 f. 374
4. a. 208 b. 182 c. 432 d. 204 e. 248 f. 560
5. a. 1 300 b. 1 600 c. 1 400 d. 2 100 e. 900 f. 2 800
6. a. 3 200 b. 1 850 c. 950 d. 3 600 e. 4 150 f. 3 100

Page 7

1. a. 102 b. 308 c. 192 d. 230 e. 1 350 f. 174 g. 328 h. 484
2. a. 1 295 b. 2 002 c. 1 197 d. 1 178 e. 840 f. 765 g. 1 032 h. 1 029
3. a. 4 b. 40 c. 15 d. 6 e. 4 f. 6

Answers (Contd)**Page 8**

1. a. 132 b. 120 c. 480 d. 360 e. 360 f. 108 g. 330 h. 238
 2. a. 483 b. 1 760 c. 1 024 d. 1 225 e. 1 248 f. 945 g. 486 h. 1 204
 3. a. 2 b. 4 c. 21 d. 13 e. 11 f. 7

Page 9**1.**

$1 \times 4 = 4$	$1 \times 8 = 8$	$1 \times 16 = 16$	$1 \times 15 = 15$	$1 \times 18 = 18$
$2 \times 4 = 8$	$2 \times 8 = 16$	$2 \times 16 = 32$	$2 \times 15 = 30$	$2 \times 18 = 36$
$3 \times 4 = 12$	$3 \times 8 = 24$	$3 \times 16 = 48$	$4 \times 15 = 60$	$4 \times 18 = 72$
$4 \times 4 = 16$	$4 \times 8 = 32$	$4 \times 16 = 64$	$8 \times 15 = 120$	$8 \times 18 = 144$
$5 \times 4 = 20$	$5 \times 8 = 40$	$5 \times 16 = 80$	$16 \times 15 = 240$	$16 \times 18 = 288$
$6 \times 4 = 24$	$6 \times 8 = 48$	$6 \times 16 = 96$	$32 \times 15 = 480$	$32 \times 18 = 576$
$7 \times 4 = 28$	$7 \times 8 = 56$	$7 \times 16 = 112$	$64 \times 15 = 960$	$64 \times 18 = 1\,152$
$8 \times 4 = 32$	$8 \times 8 = 64$	$8 \times 16 = 128$	etc	
$9 \times 4 = 36$	$9 \times 8 = 72$	$9 \times 16 = 144$		
$10 \times 4 = 40$	$10 \times 8 = 80$	$10 \times 16 = 160$		

Page 10**1.**

$1 \times 7 = 7$	$1 \times 14 = 14$	$1 \times 28 = 28$	$1 \times 13 = 13$	$1 \times 27 = 27$
$2 \times 7 = 14$	$2 \times 14 = 28$	$2 \times 28 = 56$	$2 \times 13 = 26$	$2 \times 27 = 54$
$3 \times 7 = 21$	$3 \times 14 = 42$	$3 \times 28 = 84$	$4 \times 13 = 52$	$4 \times 27 = 108$
$4 \times 7 = 28$	$4 \times 14 = 56$	$4 \times 28 = 112$	$8 \times 13 = 104$	$8 \times 27 = 216$
$5 \times 7 = 35$	$5 \times 14 = 70$	$5 \times 28 = 140$	$16 \times 13 = 208$	$16 \times 27 = 432$
$6 \times 7 = 42$	$6 \times 14 = 84$	$6 \times 28 = 168$	$32 \times 13 = 416$	$32 \times 27 = 864$
$7 \times 7 = 49$	$7 \times 14 = 98$	$7 \times 28 = 196$	$64 \times 13 = 832$	$64 \times 27 = 1\,728$
$8 \times 7 = 56$	$8 \times 14 = 112$	$8 \times 28 = 224$	etc	
$9 \times 7 = 63$	$9 \times 14 = 126$	$9 \times 28 = 252$		
$10 \times 7 = 70$	$10 \times 14 = 140$	$10 \times 28 = 280$		

Page 11

- a. 175 b. 150 c. 450 d. 775

Page 12

1. a. 55 b. 12 c. 40 d. 200 e. 150 f. 105 g. 3.5 h. 5.5
 2. a. 165 b. 120 c. 90 d. 8.5 e. 41.5 f. 14.5 g. 16.5 h. 27
 3. a. 5 b. 8 c. 15 d. 12 e. 35 f. 23 g. 16 h. 9
 4. a. 12.5 b. 24 c. 4.5 d. 28 e. 39 f. 27.5 g. 14.5 h. 0.4