Examples of Strategies

Mental Math

Grade 12 Essential Mathematics (40S)

S–1

Sample Strategies

Begin adding from the left

When you do additions using paper and pencil, you usually start from the right and work toward the left.

To do additions in your head, start from the left.

EXAMPLE 1

$$\begin{array}{r} 46 \\ +\ 38 \\ \hline \end{array}$$

40 + 30 = 70

6 + 8 = 14

70 + 14 = 84

EXAMPLE 2

$$\begin{array}{r} 25.6 \\ +\ 13.7 \\ \hline \end{array}$$

20 + 10 = 30

5 + 3 = 8

$\frac{6}{10} + \frac{7}{10} = 1$ and $\frac{3}{10}$

$30 + 8 + 1\frac{3}{10} = 39.3$

Mental Math

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S–2

Sample Strategies

Break down numbers and add their parts

Here's another way of doing additions in your head.

$$\begin{array}{r} 63 \\ +28 \\ \hline \end{array}$$

Break down the numbers, then add their parts.

EXAMPLE 1

$$\begin{array}{r} 63 \\ +\ 28 \\ \hline \end{array}$$

63 + 20 + 8

83 + 8

91

EXAMPLE 2

$$\begin{array}{r} 315 \\ +\ 276 \\ \hline \end{array}$$

315 + 200 + 70 + 6

515 + 70 + 6

585 + 6

591

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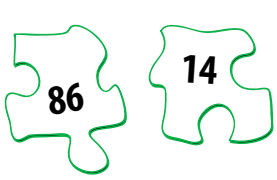
S–3

Sample Strategies

Finding compatible numbers

Compatible numbers are pairs of numbers that are easy to add in your head.

The following are examples of compatible numbers:

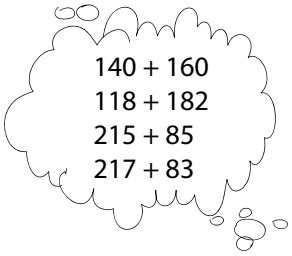


The sum equals 100.

The sum equals 600.

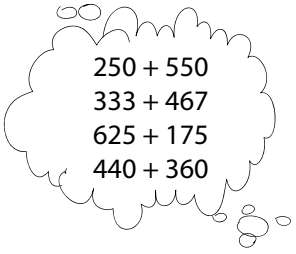
Find the pairs of compatible numbers that add up to 300.

140	85	160
118	217	73
215	182	83



Find the pairs of compatible numbers that add up to 800.

250	175	567
333	440	467
625	550	360



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S–4

Sample Strategies

Create your own compatible numbers

Sometimes it is easier to do additions in your head by creating your own compatible numbers and adjusting the total.

EXAMPLE 1

$$\begin{array}{r} 650 \\ +\ 375 \\ \hline \end{array}$$

650 + 350 + 25

1000 + 25

1025

EXAMPLE 2

$$\begin{array}{r} 1250 \\ +\ 753 \\ \hline \end{array}$$

1250 + 750 + 3

2000 + 3

2003

Mental Math

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S–5

Sample Strategies

Subtract starting from the left

Here's a technique that works well when doing subtractions that do not require grouping.

To do subtractions in your head, start from the left and think of your answer one part at a time.

EXAMPLE 1

$$\begin{array}{r} 468 \\ -\ 323 \\ \hline \end{array}$$

400 – 300 = 100

60 – 20 = 40

8 – 3 = 5

100 + 40 + 5 = 145

EXAMPLE 2

$$\begin{array}{r} 9514 \\ -\ 6203 \\ \hline \end{array}$$

9000 – 6000 = 3000

500 – 200 = 300

14 – 3 = 11

3000 + 300 + 11 = 3311

Mental Math

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S–6

Sample Strategies

Subtract one part at a time

When you do a subtraction that requires a grouping, subtract one part at a time.

EXAMPLE 1

$$\begin{array}{r} 132 \\ -\ 59 \\ \hline \end{array}$$

132 – 50 = 82

82 – 9 = 73

Check your answer by adding the following in your head:
73 + 59 = 120 + 12 = 132

EXAMPLE 2

$$\begin{array}{r} 6.25 \\ -\ 3.15 \\ \hline \end{array}$$

6.25 – 3 = 3.25

3.25 – 0.15 = 3.10

Don't forget to check your answer doing a mental addition.

Mental Math

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S–7

Sample Strategies

Balance a subtraction with whole numbers

When you add the same number to the two elements of a subtraction, the difference between the two does not change.

By adding to both elements, you balance the subtraction.

That makes it easier to find the answer in your head.

EXAMPLE 1

$$\begin{array}{r} 76 \\ -\ 28 \\ \hline \end{array}$$

76 + 2 = 78

28 + 2 = 30

78 – 30 = 48

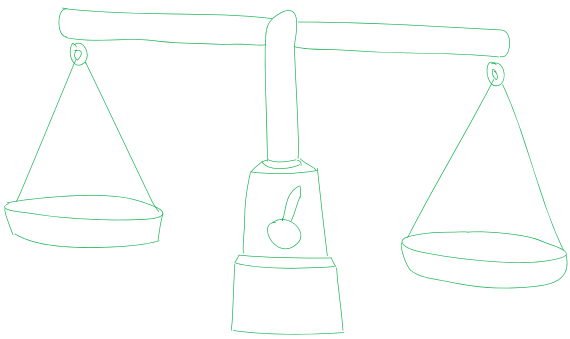
EXAMPLE 2

$$\begin{array}{r} 660 \\ -\ 185 \\ \hline \end{array}$$

660 + 15 = 675

185 + 15 = 200

675 – 200 = 475



Mental Math

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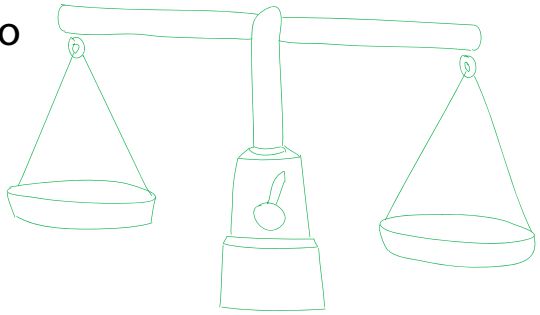
S–8

Sample Strategies

Balance a subtraction with decimal numbers

When you add the same number to the two elements of a subtraction, the difference between the two does not change.



Adding to both elements balances the subtraction.

That makes it easier to find the answer in your head.

EXAMPLE 1

$$\begin{array}{r} 4.32 \\ -\ 1.95 \\ \hline \end{array}$$

4.32 + 0.05 = 4.37

1.95 + 0.05 = 2

4.37 – 2 = 2.37

EXAMPLE 2

$$\begin{array}{r} 23.62 \\ -\ 15.89 \\ \hline \end{array}$$

23.62 + 0.11 = 23.73

15.89 + 0.11 = 16

23.73 – 16 = 7.73

Remember that you have to make sure the second element (not the first) becomes a number that is easy to subtract.

Mental Math

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S–9

Sample Strategies

Multiply starting from the left

It is easier to multiply in your head when you break down a number and multiply starting from the left.

Add in your head as you multiply each part.

$$\begin{array}{r} 635 \\ \times\ \ 4 \\ \hline \end{array}$$

600 × 4 = 2400

30 × 4 = 120

5 × 4 = 20

2400 + 120 + 20 = 2540

$$\begin{array}{r} 528 \\ \times\ \ 3 \\ \hline \end{array}$$

500 × 3 = 1500

20 × 3 = 60

8 × 3 = 24

1500 + 60 + 24 = 1584

Mental Math

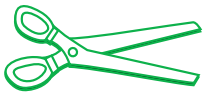
Grade 12 Essential Mathematics (40S)

Sample Strategies

S–10

Cut and paste the zeros

In multiplication, when one factor is multiplied by 10, the result is also multiplied by 10.



$$\begin{array}{r} 6 \\ \times\ 4 \\ \hline 24 \end{array} \quad \xrightarrow{\times 10} \quad \begin{array}{r} 60 \\ \times\ 4 \\ \hline 240 \end{array}$$

Knowing this concept, you can easily multiply by 10 in your head by following these steps:

1. Cut all the zeros at the end.
2. Multiply the remaining numbers.
3. Paste all the zeros back.

EXAMPLE 1

$$\begin{array}{r} 13 \\ \times\ 70 \\ \hline \end{array}$$

13 × 7 = 91

910

EXAMPLE 2

$$\begin{array}{r} 6000 \\ \times\ 1200 \\ \hline \end{array}$$

6 × 12 = 72

7,200,000

Mental Math

Grade 12 Essential Mathematics (40S)

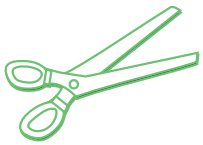
S–11

Sample Strategies

Cut and paste the zeros

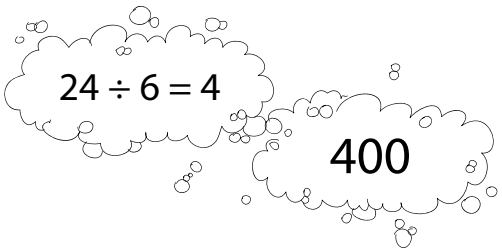
To mentally divide numbers that end in zero, follow these steps:

1. Cut all the zeros at the end.
2. Do the division.
3. Paste the zeros back.



EXAMPLE 1

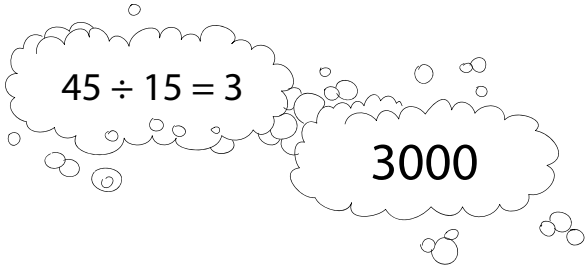
$$2400 \div 6$$



Check the answer by multiplying: $6 \times 400 = 2400$

EXAMPLE 2

$$45{,}000 \div 15$$



Check: $15 \times 3000 = 45{,}000$

Mental Math

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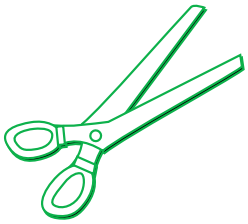
S–12

Sample Strategies

Cut the zeros in dividend and divisor

When dividing the dividend and divisor in a division by the same amount, the quotient does not change.



$$\begin{array}{r} 800 \\ \div\ 20 \\ \hline \end{array} \quad \Rightarrow \quad \begin{array}{r} 80\,\cancel{0} \\ \div\ 2\,\cancel{0} \\ \hline \end{array} \quad \Rightarrow \quad 40$$

Knowing this concept will help you do the division in your head more easily when the dividend and the divisor both end in zero.

All you have to do is divide both the dividend and divisor by the same value, 10.

EXAMPLE 1

$$\begin{array}{r} 6300 \\ \div\ 90 \\ \hline \end{array}$$

630 ÷ 9

70

EXAMPLE 2

$$\begin{array}{r} 4{,}500{,}000 \\ \div\ 500 \\ \hline \end{array}$$

45,000 ÷ 5

9000

Mental Math

Grade 12 Essential Mathematics (40S)

S–13

Sample Strategies

Work with prices

The sale price of items is often a little less than an even number of dollars.

To work with prices in your head, round off to the nearest dollar. Then, do the calculation required by the problem and adjust your answer.

EXAMPLE 1

$$\begin{array}{r} \$16.65 \\ +\ \$2.99 \\ \hline \end{array}$$

$16.65 + $3 = $19.65

$19.65 – 1¢ = $19.64

EXAMPLE 2

$$\begin{array}{r} \$19.98 \\ \times\quad 6 \\ \hline \end{array}$$

6 × $20 = $120

6 × 2¢ = 12¢

$120 – 12¢ = $119.88

Mental Math

Grade 12 Essential Mathematics (40S)

Sample Strategies

S–14

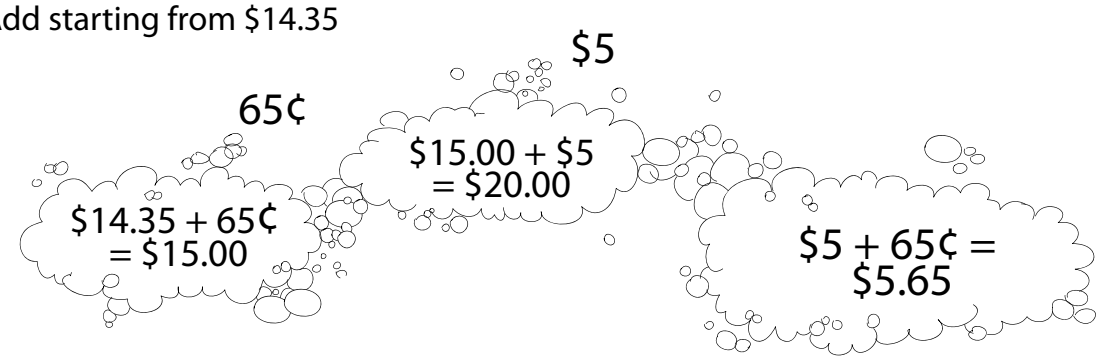
Check your change

When you buy something, it is important to check that the amount of change returned to you is correct.

There is an easier way than subtracting in your head: **add to the purchase price**.

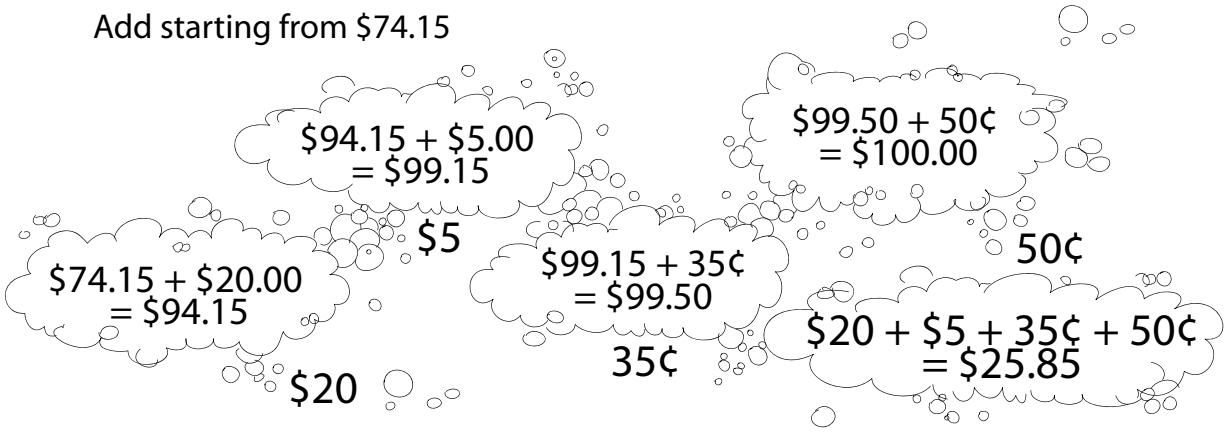
EXAMPLE 1 You buy a CD for $14.35 with a $20 bill. How much change should you get back?

Add starting from $14.35



EXAMPLE 2 You buy a watch for $74.15 with a $100 bill. How much change should you get back?

Add starting from $74.15



Mental Math

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S–15

Sample Strategies

Find the time difference

Mental math calculation is useful to find how much time is left before an event.

To find the difference between two given times, add by steps.

EXAMPLE 1 If it is 8:27 a.m., how long do you have to wait before lunch at noon?

8:27 a.m. to 8:30 a.m.
3 MINUTES

TO 9:00 a.m.
30 MINUTES

TO 12:00 noon
3 HOURS

3 HOURS
33 MINUTES

EXAMPLE 2 If it is 9:50 a.m., how much time is there before 8:15 p.m.?

9:50 a.m. to 10:00 a.m.
10 MINUTES

TO 8:00 p.m.
10 HOURS

TO 8:15 p.m.
15 MINUTES

10 HOURS
25 MINUTES

Mental Math

Grade 12 Essential Mathematics (40S)

S–16

Sample Strategies

Change quarter fractions to a decimal or a percent

When converting quarters, you can think of the context of money where 1 dollar is the whole and the fractions are the number of coins called "quarters." The fraction, $\frac{3}{4}$, is read, "three quarters." The value of three quarters is \$0.75, which is $\frac{3}{4}$ of a dollar or 75% of a dollar. Similarly, you can do these conversions by thinking of the context of money:

$\frac{1}{4}$ = one quarter = 0.25 = 25%

$\frac{2}{4}$ = two quarters = 0.50 or 50%

$\frac{4}{4}$ = four quarters = 1.00 = 100%

$\frac{5}{4}$ = five quarters = 1.25 or 125%

You can also think of the context of dollars when dividing by quarters.

EXAMPLE 1

$\frac{3}{0.25} = 12$

Think of 3 dollars divided into a group of quarters. There are 12.

EXAMPLE 2

$\frac{5}{0.25} = 20$ or $5 \div \frac{1}{4} = 20$

Think of 5 dollars divided into a group of quarters. There are 20.

Another context that can be useful is time on a clock. Thinking of quarters can help you change fractions of an hour to minutes in time questions where the whole is 1 hour. There are 60 minutes in one hour and $60 \div 4 = 15$. Therefore, one-quarter of an hour is 15 minutes.

$\frac{1}{4}$ = one-quarter of an hour = 15 minutes

$\frac{3}{4}$ = three-quarters of an hour = 45 minutes

$\frac{2}{4}$ = two-quarters of an hour = half an hour = 30 minutes

EXAMPLE 3

Write 2 h, 15 min. in units of hours.

15 minutes is a quarter of an hour. It is equal to 2.25 hours.

EXAMPLE 4

Write 4.75 hours as hours and minutes.

0.75 is the same as three-quarters and three-quarters of an hour is 45 minutes. It is equal to 4 h, 45 min.