

Numeracy Skills and Mathematics



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Fouad has a WWVP certificate, and is happy to animate a numeracy session at your school.

Also available: a presentation on Photonics

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Contents

- ***Perception of Numerical Skills (Mental Calculation)***
- ***Can Mental Calculation be correlated to mathematics?***
 - *Multiplication/Division by 5, 25 or 50 – Examples*
 - *Multiplication by 11 – Examples*
- ***Can Mental Calculation be correlated to mathematics?***
 - *Example 1 35x35 and link to Mathematics*
 - *Example 2 63x57 and link to Mathematics*
- ***Other Forms of Mental Calculation:***
 - *Examples from Numbers and Letters program*
 - *Calculation Challenges (30sec) with 5 operations comprising all four operations*
- ***IEEE websites for School Teachers***
- ***Conclusions***

Perception of Numerical Skills (Mental Calculation)

A common perception:
a mathematician is not necessarily good in mental calculation

However Mathematics can be helpful to improve numeracy skills

Examples:

- ▶ $13 * 50$
- ▶ $31 * 25$
- ▶ $53 * 11$

Basic Hints in Numeracy Skills

Multiplication by 5 or Division by 5

$$46 * 5$$

The easiest: $46/2$ is 23 and add "0" thus 230

$$530 : 5$$

divide by 10 and multiply by 2 thus 106

Multiplication by 50 or Division by 50

▶ $16 * 50$

Divide by 2 and multiply by 100 thus 800

▶ $3100 : 50$

Divide by 100 and multiply by 2 thus 62

Multiplication by 25 or Division by 25

▶ $16 * 25$

Divide by 4 and multiply by 100 400

▶ $31 * 25$

$32 * 25$ is 800 minus 25 775

▶ $850 : 25$

Multiply by 4 and divide by 100 34

Basic Hints in Numeracy Skills

Multiplication by 11

$$53 * 11 \quad 53 * 10 + 53 * 1 = 530 + 53 = 583$$

$$\begin{array}{r} 530 + \\ 53 \\ \hline 583 \end{array}$$

The easiest: 5+3 is 8 and insert 8 between 5 and 3 thus 583

$$74 * 11$$

$$7 + 4 = 11$$

Insert 1 and add 1 to the “7”

Answer 814

Can Mental Calculation be correlated to mathematics?

Example 1

Square of two digit numbers ending with 5

$$25 \times 25 =$$

$5 \times 5 = 25$ hence the answer ends with 25

$2 \times (2+1) = 6$ which is the hundreds digit of the answer

$$\text{Thus } 25 \times 25 = 625$$

$$65 \times 65 = 4225$$

How we can link this to Mathematics taught in Y9-10

Can Mental Calculation be correlated to mathematics?

Example 1

We all know

$$(a+b)^2 = a^2 + b^2 + 2ab$$

65^2 is $(60+5)^2$ and 60 is 6×10

In abstract form: the ten digit can be written as $10 \cdot y$ (y is 6 in our example)

So a^2 is $y^2 \times 10^2 = 100 y^2$

b^2 5×5 is 25

$2ab$ is $2 \times 10 \times y \times 5 = 100 y$

Sum $100y^2 + 100y + 25$ or $100(y^2+y)+25$ or $100 \cdot y \cdot (y+1) + 25$

$$100 \cdot 6 \cdot 7 + 25 = 4225$$

Can Mental Calculation be correlated to mathematics?

Example 2

$$63 * 57$$

$60 * 57$ is $3420 + 3 * 57$ (171) so final answer is 3591

Can we do it faster?

$$63 = 60 + 3 \text{ and } 57 = 60 - 3$$

$$(a+b) * (a-b) = a^2 - b^2$$

$$60^2 - 3^2 = 3600 - 9 = 3591$$

$$\text{Another test: } 84 * 76 = 6400 - 16 = 6384$$

Other Forms of Mental Calculation

Examples from “Numbers & Letters”

Starting points: 6 numbers

3 75 7 1 25 7 Target: 551

Use each number one time & use any of the 4 operators + - * :
30 or 40 sec

$$75 * 7 = 525 + 25 = 550 + 1 = 551$$

25 1 2 7 7 9 Target: 977

Answer:

$$7 * 7 = 49 - 9 = 40 - 1 = 39 \text{ then } 25 * 39 = 975 + 2 = 977$$

More Examples from “Numbers & Letters”

4 75 4 5 50 100 Target: 413

Answer:

$$75 + 4 + 4 = 83 * 5 = 415 \quad 100 : 50 = 2 \text{ \& } 415 - 2 = 413$$

1 5 5 1 100 50 Target: 979

Answer:

$$100 : 5 = 20 \quad 50 - 1 = 49 \quad 49 * 20 = 980 \quad 980 - 1 = 979$$

Other Numerical Challenges

$$((((101 * 11) - 110) : 11) + 111) * 11 = ? \quad 30\text{sec}$$

Answer 2222

$$((((35 * 26) + 98) : 14) * 6) - 82 = ? \quad 30\text{sec}$$

Answer 350

Other Numerical Challenges

$$((((32 * 17) + 96) : 10) * 12) - 751 = ? \quad 30\text{sec}$$

Answer 17

$$((((12 * 18) + 50) : 7) * 15) - 234 = ? \quad 30 \text{ sec}$$

Answer 336

Other Numerical Challenges

$$((((52 * 13) + 182) / 11) * 4) - 255 = ?$$

$$((((176 : 4) : 2) + 22) * 3) - 34 = ?$$

$$((((18 * 18) + 540) : 9) - 63) * 27 = ?$$

$$((((32 * 12) + 236) : 5) * 9) - 1083 = ?$$

$$((((126 * 9) : 18) + 153) : 24) - 9 = ?$$

$$((((1025 - 960) * 15) + 1000) : 5) + 5 = ?$$

Look at possible
simplifications

The Institute of Electrical and Electronics Engineers, Inc. (IEEE) is pleased to be able to provide FREE lesson plans to all teachers of STEM education subjects.

tryengineering.org/lesson-plans

trynano.org/resources/nanotechnology-lesson-plans

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Some lesson plans have been aligned to the Australian National Curriculum. They can be viewed at: ieee-ac.org/TISP/