UNIVERSITY OF WATERLOO
University of Waterloo
Faculty of Mathematics

Centre for Education in
Mathematics and Computing

Grade 6 Math Circles
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Arithmetic Tricks

Warm-up

1) $12 \times 13 = 156$	2) $15 \times 21 = 315$	3) $81 \times 12 = 972$	4) $32 \times 68 = 2176$	5) $41 \times 77 = 3157$
6) $67 \times 45 = 3015$	7) $27 \times 29 = 783$	8) $61 \times 9 = 549$	9) $86 \times 11 = 946$	10) $82 \times 89 = 7298$
11) $61 \times 14 = 854$	12) $27 \times 12 = 324$	13) $53 \times 24 = 1272$	14) $76 \times 46 = 3496$	15) $35 \times 99 = 3465$
16) $85 \times 11 = 935$	17) $55 \times 71 = 3905$	18) $83 \times 9 = 747$	19) $31 \times 23 = 713$	20) $74 \times 76 = 5624$
21) $52 \times 13 = 676$	22) $40 \times 22 = 880$	23) $23 \times 77 = 1771$	24) $38 \times 15 = 1275$	25) $62 \times 9 = 558$

Multiplication Tricks:

Multiplication by 9

Examples:

a) $\begin{array}{r} 25 \\ \times\ 9 \\ \hline 225 \end{array}$

b) $\begin{array}{r} 36 \\ \times\ 9 \\ \hline 324 \end{array}$

c) $\begin{array}{r} 65 \\ \times\ 9 \\ \hline 585 \end{array}$

Multiplication by 11

Examples:

a) $\begin{array}{r} 24 \\ \times 11 \\ \hline 264 \end{array}$

b) $\begin{array}{r} 43 \\ \times 11 \\ \hline 473 \end{array}$

c) $\begin{array}{r} 76 \\ \times 11 \\ \hline 836 \end{array}$

Multiplying 2-digit Numbers

Examples:

a) $\begin{array}{r} 21 \\ \times 14 \\ \hline 294 \end{array}$

b) $\begin{array}{r} 13 \\ \times 15 \\ \hline 195 \end{array}$

c) $\begin{array}{r} 21 \\ \times 61 \\ \hline 1281 \end{array}$

Exercises:

1) Multiply the following:

1) $15 \times 13 = 195$

2) $25 \times 24 = 600$

3) $21 \times 61 = 1281$

4) $62 \times 11 = 682$

5) $56 \times 9 = 504$

6) $64 \times 62 = 3968$

7) $20 \times 42 = 840$

8) $92 \times 9 = 828$

9) $61 \times 11 = 671$

10) $97 \times 48 = 4656$

11) $83 \times 74 = 6142$

12) $30 \times 99 = 2970$

13) $85 \times 83 = 7055$

14) $64 \times 52 = 3328$

15) $53 \times 64 = 3392$

16) $85 \times 15 = 1275$

17) $63 \times 13 = 819$

18) $83 \times 99 = 8217$

19) $31 \times 96 = 2976$

20) $74 \times 36 = 2664$

21) $21 \times 23 = 483$

22) $44 \times 22 = 968$

23) $27 \times 11 = 297$

24) $12 \times 33 = 396$

25) $32 \times 23 = 736$

26) $34 \times 20 = 680$

27) $14 \times 12 = 168$

28) $27 \times 16 = 432$

29) $41 \times 25 = 1025$

30) $44 \times 22 = 968$

31) $36 \times 15 = 540$

32) $28 \times 9 = 252$

33) $26 \times 11 = 286$

34) $34 \times 9 = 306$

35) $18 \times 22 = 396$

36) $65 \times 99 = 6435$

2) 99: Multiply by 100 then subtract the number
999: Multiply by 1000 then subtract the number.
9999: Multiply by 10000 then subtract the number.

3) Yes! Try it!

4) Multiply the following:

a) $\begin{array}{r} 2163 \\ \times \quad 11 \\ \hline 23793 \end{array}$ b) $\begin{array}{r} 21634172 \\ \times \quad 11 \\ \hline 237975892 \end{array}$ c) $\begin{array}{r} 9865742 \\ \times \quad 11 \\ \hline 108523162 \end{array}$ d) $\begin{array}{r} 2168932157 \\ \times \quad 11 \\ \hline 23858253727 \end{array}$

6) Multiply the following:

a) $\begin{array}{r} 22 \\ \times 22 \\ \hline 484 \end{array}$ b) $\begin{array}{r} 63 \\ \times 63 \\ \hline 3969 \end{array}$ c) $\begin{array}{r} 34 \\ \times 34 \\ \hline 1156 \end{array}$ d) $\begin{array}{r} 81 \\ \times 81 \\ \hline 6561 \end{array}$

8) Expand the following using FOIL.

a)$(r+s)\times(t+u) = (r\times t)+(r\times u)+(s\times t)+(s\times u)$

b)$(3+x)\times(5+y)= 15+3y+5x+(x\times y)$

c)$(m+15)\times(9+n) = 9m+(m\times n)+135+15n$

d)$(5r+3z)\times(8p+4q) = 40(r\times p)+20(r\times q)+24(z\times p)+12(z\times q)$

Division Tricks:

Examples:

a) Is 346215 divisible by 3?

$3+4+6+2+1+5=11$. No 346215 is not divisible by 3 since the sum of the digits is not divisible by 3.

b) Is 125498592 is divisible by 4?

$92\div 4 = 23$. Yes 125498592 is divisible by 4 since the last two digits are divisible by 4.

c) Is 9273 is divisible by 11?

$9-2+7-3=11$. Yes 9273 is divisible by 11 since the alternating sum is divisible by 11.

Exercises:

1) Yes. $135 \div 8 = 17$

2) No. $5 + 4 + 3 + 6 + 2 + 8 = 28$ which is not divisible by 3.

3) Yes. First multiply the last digit, which is 7, by 9 (which equals 63) and subtract from the remaining digits (33395). Continue with this pattern until you have only two digits (you should get -26) which is divisible by 13 so 333957 is divisible by 13.

4) Yes. $1-3+4-6+2-9+8-4+9-9+3-1+6-7+6 = 0$ which is divisible by 11.

5) No. First multiply the last digit, which is 0, by 2 and subtract from the remaining digits (39891). Continue with this pattern until you have only two digits left (you should end with 37) which is not divisible by 7, so 398910 is not divisible by 7.

6) $c = 3$.

7) $r = 4$

8) $z = 1$ or 8

9) a) 2: add 1
   b) 3: add 0
   c) 4: add 1
   d) 5: add 0
   e) 6: add 3
   f) 7: add 3

10) Multiple answers. One solution is: 29654321472.

11) Multiple answers. One solution is: 49147560.