3.5 Mental Math and Estimation

Important Note: Estimation is an *approximate* answer to an arithmetic problem.

Some Mental Math Strategies:

1. Use commutativity/associativity/distributivity

ex. 13 + 21 + 45 + 39 + 27

$= (13+27)+(21+39)+45 = 40+60+45 = 145$

2. Additive/multiplicative compensation (add zero / multiply by 1)

ex. 98 + 47 $= 98+2+47-2 = 100+45 = 145$

64(5) $\left(\frac{2}{2}\right) = \frac{64(10)}{2} = 32(10) = 320$

$64(5) = 60 \cdot 5 + 4 \cdot 5 = 320$

3. Special factor

ex. 48(25) $= 48(25)\left(\frac{4}{4}\right) = \frac{48}{4}(100) = 1200$

84(5) $= 420$

4. Left-to-right addition

ex. 237 + 436 $= 600 + 60 + 13 = 673$

Some Estimation Strategies:

1. Range estimate

ex. 196(23)

$3920 = 196(20) \leq 196(23) \leq 200(23) = 4600$

2. Compatible number estimation

ex. 89(15) $\simeq 90(15) = 1350$

3. Rounding

ex. 2317 + 4341 $\simeq^{①} 2320 + 4340 = 6660$ (to tens digit)

$\simeq^{②} 2300 + 4300 = 6600$ (to hundreds digit)

More examples:

1. 40 + 160 + 29 + 31 $= 200 + 60 = 260$

2. 75 + 28 $= (70+20)+(5+8)$
$= 90+13 = 103$

② $75+25+3 = 103$

③ $75+5+28-5 = 80+23 = 103$

④ $78+2+75-2 = 30+73 = 103$

3. 3679 - 474

① $= 3679-474-5+5$
$= 3679+5-479 = 3200+5 = 3205$

② $3000-0+600-400+70-70+9-4$
$= 3200+5 = 3205$

③ $3600-400+79-74 = 3205$

4. $5075 \div 25$ ① $= \frac{5000}{25} + \frac{75}{25}$
$= 200+3 = 203$

② $\frac{5075}{25}\left(\frac{4}{4}\right) = \frac{20000+300}{100.}$
$= \frac{20300}{100} = 203$

5. 123(3) $= 369$

6. $25 \times 32 \times 4 = (25 \cdot 4)32 = 3200$

7. Fliers are being delivered to 3625 houses and there are 42 people who will be doing the distribution. If distributed equally, about how many houses will each person visit?

$3625 \div 42 \simeq 3600 \div 40 = 90$

Without computing, tell which of the following have the same answer.

(a) 88(44) and 44(22)

$\neq 22(44)$

(b) 93(15) and 31(45)

$93(15) = 3(31)(15) = 31(3 \cdot 15)$

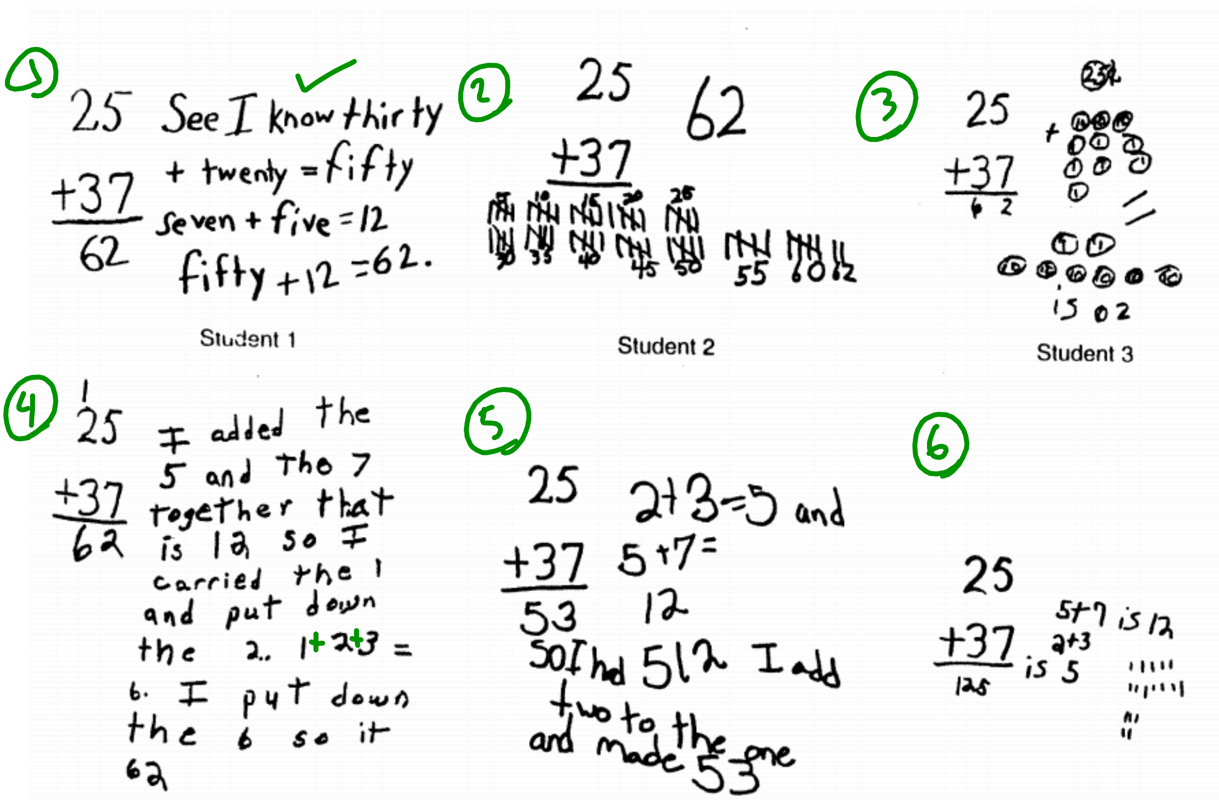
$= 31(45)$

(c) 12(18) and 20(17)

$\neq$

Can you "estimate" by calculating the answer exactly and then rounding?

NO



Student 1 Student 2 Student 3

Student 4 Student 5 Student 6

7 What are they thinking?

$$\begin{array}{r} 23 \\ -15 \\ \hline 12 \end{array}$$

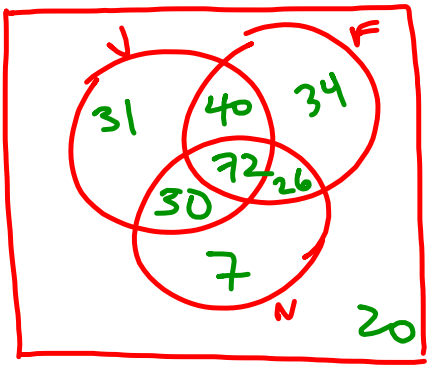
8
$$\begin{array}{r} 562 \\ -237 \\ \hline 325 \end{array}$$

9
$$\begin{array}{r} 562 \\ -287 \\ \hline 185 \end{array}$$

10
$$\begin{array}{r} 53 \\ \times\ 4 \\ \hline 242 \end{array}$$

midl

5)



(b) 31

(c) 72+26 = 98

(d) 40+30+72+26 = 168

260 total

✓ 173 V

✓ 112 F and V

✓ 125 not N

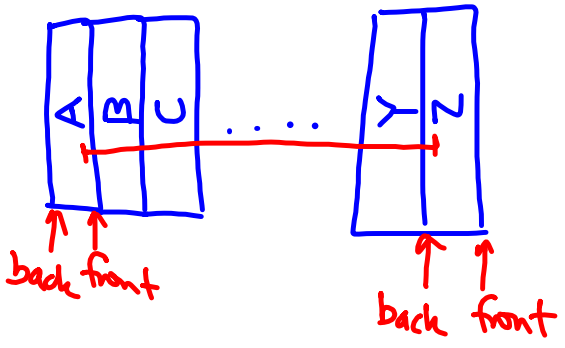
✓ 72 all three

✓ 88 not F

✓ 51 not F and not N

✓ 20 none

9E)



$24\left(\frac{3}{2}\right) + 2\left(\frac{1}{8}\right)$

$= 36 + \frac{1}{4} = 36\frac{1}{4}$ in

7) $49(34)+66(49) = 49(34)+49(66)$

$= 49(34+66) = 49(100) = 4900$

$20(8179 \cdot 5) = (20 \cdot 5)8179 = 100(8179) = 817{,}900$

$= 20 \cdot 8179 \cdot 5$

$2(3 \cdot 5) = 2(15) = 30$ | $2(3 \cdot 5) \stackrel{?}{\neq} (2 \cdot 3)(2 \cdot 5)$

$= 6(10) = 60$

3.5 B

6) (a) $74-63 = 1+10 = 11$

$74-63 = ?$

$63+\_\_ = 74$

(b) $73-57$

$= 10+5+1 = 16$

$63+7=70$

$70+4=74$

$7+4=11$

MC #4

① $49.51+49.49 = 4900$

② $98.37+2.37 = 3700$

③ $99.37+37 = 3700$

$(99+1)37 = 100(37)$

① $49(51+49)$

$= 49(100)$

$= 4900$

A #11

(a) $2215+3023+5987+975$

$\simeq 12000+200 = 12200$

MC #12

ex $384(10) = 3840$

$384(10) = (3(100)+8(10)+4(1))10$

$= 3(10^2)10 + 8(10)10 + 4(1)(10)$

$= 3(10^3)+8(10^2)+4(10) = 3840$

$234_5(10_5) = 2340_5$

A2) (a) $2.9.5.6 = (2.5)(9.6) = 10(54) = 540$

(b) $8.25.7.4 = (25.4)(8.7) = 5600$