SOLUTIONS TO EXERCISES:
NUMBERS HAVE LOTS OF DIFFERENT NAMES!

IN-SECTION EXERCISES:

1. STEP 1: $\overbrace{0}^{0 \text{ pets}} + 2 = 2$; write down the number 2, and circle it.

Since you own fewer than 2 pets, go to STEP 2.

STEP 2: $2 - \overbrace{0}^{0 \text{ pets}} = 2$; $2 \cdot 2 = \boxed{4}$; write down the number $\boxed{4}$, and put a box around it. Go to STEP 4.

STEP 4: $\overbrace{0}^{0 \text{ pets}} \cdot \overbrace{0}^{0 \text{ pets}} = 0$; $0 + \boxed{4} = 4$

2. STEP 1: $\overbrace{7}^{7 \text{ pets}} + 2 = 9$; write down the number 9, and circle it.

Since you own more than 2 pets, go to STEP 3.

STEP 3: $\overbrace{7}^{7 \text{ pets}} - 2 = 5$; opposite is -5 ; $(-5) \cdot 9 = \boxed{-45}$. Write down the number $\boxed{-45}$ and put a box around it.

STEP 4: $\overbrace{7}^{7 \text{ pets}} \cdot \overbrace{7}^{7 \text{ pets}} = 49$; $49 + (\boxed{-45}) = 4$

3. $2 \cdot 8 + 5 \cdot 4$: give 2 pieces of candy to each of 8 kids, and 5 pieces of candy to each of 4 kids; OR
give 2 pieces to each of 8 kids, and 4 pieces to each of 5 kids; OR
give 8 pieces to each of 2 kids, and 5 pieces to each of 4 kids.

$5 \cdot 7 + 1$: give 5 pieces of candy to each of 7 kids, with 1 piece left over.

4.

name for 60	information revealed by name
$6 \cdot 10$	give 6 pieces of candy to each of 10 kids; or give 10 pieces of candy to each of 6 kids
$3 \cdot 20$ or $20 \cdot 3$	60 pieces of candy can be evenly distributed among 3 kids, by giving 20 pieces to each
$7 \cdot 8 + 4$ or $8 \cdot 7 + 4$	give 7 pieces of candy to each of 8 kids, with 4 pieces left over
$16 \cdot 3 + 2 \cdot 6$	give 16 pieces to each of 3 kids, and 2 pieces to each of 6 kids; OR give 3 pieces to each of 16 kids, and 6 pieces to each of 2 kids; OR give 16 pieces to each of 3 kids, and 6 pieces to each of 2 kids; OR give 3 pieces to each of 16 kids, and 2 pieces to each of 6 kids.
$\frac{1}{3}(180)$	give one-third of a piece to each of 180 kids

5. The universal set for x is $\mathbb{R}$ because the theorem says 'For all real numbers x ...' .

6. You can add zero to any real number, and this doesn't change the identity of the number. Adding zero gives a new *name* for a number, but doesn't change where it *lives* on a real number line. Consequently, the number 0 is often given the fancy name 'additive identity'.

7. The universal set for x is $\mathbb{R}$ because the theorem says 'For all real numbers x ...' .

8. You can multiply any real number by 1 , and this doesn't change the identity of the number. Multiplying by 1 gives a new *name* for a number, but doesn't change where it *lives* on a real number line. Consequently, the number 1 is often given the fancy name 'multiplicative identity'.

9. (a) $0 = 5 + (-5) = (-5) + 5 = 5 - 5$

(b) $0 = \frac{1}{2} + (-\frac{1}{2}) = (-\frac{1}{2}) + \frac{1}{2} = \frac{1}{2} - \frac{1}{2}$

(c) $0 = 3.2 + (-3.2) = (-3.2) + 3.2 = 3.2 - 3.2$

(d) $0 = (-7) + 7 = 7 + (-7)$

10. (a) $1 = \frac{5}{5} = 5 \cdot \frac{1}{5} = \frac{1}{5} \cdot 5$

(b) $1 = \frac{1/2}{1/2} = \frac{1}{2} \cdot 2 = 2 \cdot \frac{1}{2}$

(c) $1 = \frac{3.2}{3.2} = 3.2 \cdot \frac{1}{3.2} = \frac{1}{3.2} \cdot 3.2$

(d) $1 = \frac{-7}{-7} = -7 \cdot \frac{1}{-7} = \frac{1}{-7} \cdot (-7)$ When a negative number comes after a centered dot, it is customary to put the negative number insides parentheses, because $\frac{1}{-7} \cdot -7$ can look somewhat confusing.

11. (a) true

(b) Since ' $2+3=5+1$ ' is false, the entire sentence ' $2+3=1+5=6$ ' is false. Students sometimes 'string' things together with equal signs as they work through a calculation, using '=' to mean something like 'I'm going on to the next step'. DON'T DO THIS! BE CAREFUL!

(c) true: $1+2+3=1+5$ is true, and $1+5=6$ is true.

(d) true for all nonzero real numbers t ; not defined if $t = 0$

(e) true

(f) $1 + (2+3) + 4 = 5$ is false; $5 = 1 + 5$ is false; $1 + 5 = 6 + 4$ is false; $6 + 4 = 10$ is true. The entire sentence is FALSE because there is at least one 'piece' that is false. (Indeed, in this case, three of the four subsentences are false!)

12. $a = b = c = d$ is shorthand for: $a = b$ and $b = c$ and $c = d$

END-OF-SECTION EXERCISES:

13. EXP (simplest name: 36)

14. SEN, true

15. SEN, false (Don't use '=' to mean that you're going on to the next step!)

16. SEN, always true

17. SEN, true