1. Evaluate the expression: 8 + **(2 x 5)** x 34 ÷ 9
2. Insert parentheses to make each equation true.

a) 11 – 7 ÷ 2 = 2 b) 1 + 2 x 15 – 4 = 33

c) 7 – 2 x 2 – 1 = 9 d) 5 x 6 ÷ 2 + 1 = 10

1. If ◊ represents the number of the newspapers that Lee Ann delivers each weekday, and ∇ represents the number of newspapers that Lee Ann delivers each day on weekends, which of the following represents the total number of newspapers that Lee delivers each week?

A) ( 5 + ◊ ) + ( 2 +∇ )

B) ( 5 + ◊ + ∇ ) × 2

C) ( 5 × ◊ ) + ( 2 × ∇ )

D) ( 5 × ◊ ) × ( 2 × ∇ )

1. A lily pad doubles in size each day. If it takes 28 days for the lily pad to cover the entire pond, how many days will it take to cover one-fourth of the pond?
2. When dropped from above the ground, an anti-gravity bouncy ball will bounce twice as high as the distance from which it is dropped.  If the ball is initially dropped from one foot above the ground, how many feet will the ball have traveled when the ball hits the ground for the sixth time?
3. Sonja swims in races. This season she notices that she drops in time for her butterfly at each race by 1/3 of the time she dropped at the previous race. She began the season at 1 minute and 25 seconds, the second race she did 1 minute and 7 seconds, an 18 second drop. What should her time be in the 5th race? Express you answer to the nearest one hundredth of a second.

1. Using the operations addition, subtraction, multiplication, or division in any order you need to how can you get the number 1 using exactly five 2s? Insert the operations you need and parentheses to make the equation true.

2 \_\_ 2 \_\_ 2 \_\_ 2 \_\_ 2 = 1

1. A bank teller doesn’t realize that on his computer screen the digit in the one’s place is not printing. So his screen reads $12 when the actual number could be $126, because he doesn’t see the 6. A customer makes him aware of the problem when she doesn’t get the right amount of cash. What’s the most the teller might have short-changed his customer if the number he saw on his screen was a two-digit number?

**BONUS PROBLEMS**

1. Wizzo comes from a planet with a base 8 number system that came from their having eight fingers. Our 10 is Wizzo’s 12. He shows you the following calculation:

 3 7

 + 4 5

 1 0 4

What is the same calculation in our base 10 number system? You need to show the two

numbers being added as well as the sum.

1. Express the difference 10112 – 1102 in base 2.
2. What is 20117 expressed as a base nine number?
3. Maria writes the same whole number in each box below and gets a true statement. Jon does the same as Maria and also gets a true statement. But Jon and Maria choose different numbers. What two numbers do they choose?

12 + ( □ × □ ) - (7 × □ ) = 0

**Solutions**

*Note: There are many acceptable strategies to solving each problem. This sheet shows just one strategy.*

1. 8 + (2 × 5) × 34 ÷ 9

8 + 10 x 81 ÷ 9

(do multiplication and division first)

8 + 810 ÷ 9

8 + 90

98

**Answer: 98**

1. a) **Answer: (11 – 7) ÷ 2 = 2**

b) **Answer: (1 + 2) × (15 – 4) = 33**

c) **Answer: (7 – 2) × 2 – 1 = 9**

d) **Answer: (5 × 6) ÷ (2 + 1) = 10**

1. **Answer: C**
2. Work backwards:

At 28 days, the lily covers the whole pond.

Therefore, at 27 days, it covers $\frac{1}{2}$ of the pond.

Therefore, at 26 days, it covers $\frac{1}{4}$ of the pond.

**Answer: 26 days.**

****

1 + 2 + 2 + 4 + 4 + 8 + 8 + 16 + 16 + 32 + 32 = 125ft.

**Answer: 125ft.**

1. First race Time: 1 min 25 sec

Second race Drop: 18 seconds Time: 1 min 7 sec

Third race Drop: 6 seconds Time: 1 min 1 sec

Fourth race Drop: 2 seconds Time: 59 sec

Fifth race Drop: 0.666 seconds Time: 58.333 sec

**Answer: 58.33 seconds**

1. Several possible answers:

 (2 + 2 + 2) ÷ 2 – 2 = 1

 2 – (2 ÷ 2 × 2 ÷ 2) = 1

 2 – (2 ÷ 2) + (2 – 2) = 1

 2 + 2 – 2 – (2 ÷ 2) = 1

 2 × 2 – (2 + (2 ÷ 2)) = 1

 (… possibly others as well …)

1. If the actual number was $999 and the computer screen showed $99, then the teller would owe the customer $900.

**Answer: $900**

1. The place values for the base 8 number system are:

 82 81 80

 64 8 1

So, in the following calculation:

 **3 7**

 **+ 4 5**

 **1 0 4**

The number 378 actually has a value of (3x8) + (7x1) = 31.

Similarly, the number 458 has a value of (4x8) + (5x1) = 37.

And the number 104 has a value of (1x64) + (0x8) + (4x1) = 68.

So, in base 10, the calculation becomes:

 **3 1**

 **+ 3 7**

 **6 8**

1. We can convert to base 10, do the subtraction, and then convert back to base 2. The place values in the base 2 number system are:

 23 22 21 20

 8 4 2 1

So, the number 10112 is actually (1x8) + (0x4) + (1x2) + (1x1) = 1110

And the number 1102 is actually (1x4) + (1x2) + (0x1) = 610

Subtracting in our own number system, 11 – 6 = 5. The way to write a 5 in base 2 is 1012, because (1x4) + (0x2) + (1x1) = 5.

But we can also just do the subtraction directly in the base 2 number system as follows. When we get to the column that is third from the right, we have to “regroup” or “borrow”, but we are borrowing “2” instead of “10”.

 0 2

 ~~1~~ ~~0~~ 1 1

 - 1 1 0

 1 0 1

1. The easiest way is to first convert 20117 to our own base 10 number system, and then convert from there to the base 9 number system.

The place values for the base 7 number system are:

 73 72 71 70

 343 49 7 1

So, the number 20117 represents (2x343) + (0x49) + (1x7) + (1x1) = 69410.

Now, the place values for the base 9 number system are:

 93 92 91 90

 729 81 9 1

So, trying to find out how many of each place value we need, in order to make up 694, we get:

 **8** x 81 = 648 (good so far, but still have 46 more to go)

 **5** x 9 = 45 (good so far, but still have 1 more to go)

 **1** x 1 = 1 (yay!)

 = 694

So, the base nine representation is 8519

**Answer: 8519**

1. Using trial and error, discover that both 3 and 4 work.

**Answer: 3 and 4**