Worksheet 1: Introduction to Doubling Patterns

Part A: Complete the Doubling Pattern

Directions: Double each number to find the next number in the pattern.

1. 2, 4, 8, _____, _____, _____
2. 3, 6, 12, _____, _____, _____
3. 5, 10, 20, _____, _____, _____
4. 1, 2, 4, _____, _____, _____
5. 7, 14, 28, _____, _____, _____

Part B: Find the Missing Numbers

Directions: Fill in the missing numbers in these doubling patterns.

6. 4, _____, 16, 32, _____
7. 6, 12, _____, 48, _____
8. _____, 18, 36, _____, 144
9. 10, _____, 40, 80, _____
10. _____, 22, _____, 88, 176

Part C: Create Your Own Doubling Patterns

Directions: Start with the given number and create a doubling pattern with 4 numbers.

11. Start with 3: _____, _____, _____, _____
12. Start with 8: _____, _____, _____, _____
13. Start with 15: _____, _____, _____, _____

Part D: Word Problems

14. Tom has 5 marbles. He doubles his collection each week. How many marbles will he have after 3 weeks?

Week 1: _____ Week 2: _____ Week 3: _____

15. A plant grows by doubling its height each month. If it starts at 2 cm, how tall will it be after 4 months?

Month 1: _____ Month 2: _____ Month 3: _____ Month 4: _____

Worksheet 2: Introduction to Halving Patterns

Part A: Complete the Halving Pattern

Directions: Halve each number to find the next number in the pattern.

1. 64, 32, 16, _____, _____, _____
2. 80, 40, 20, _____, _____, _____
3. 96, 48, 24, _____, _____, _____
4. 128, 64, 32, _____, _____, _____
5. 100, 50, 25, _____, _____, _____

Part B: Find the Missing Numbers

Directions: Fill in the missing numbers in these halving patterns.

6. 144, _____, 36, 18, _____
7. 200, 100, _____, 25, _____
8. _____, 56, 28, _____, 7
9. 160, _____, 40, 20, _____
10. _____, 90, _____, 22.5, 11.25

Part C: Identify the Pattern

Directions: Write "Doubling" or "Halving" for each pattern.

11. 8, 16, 32, 64 → _____
12. 72, 36, 18, 9 → _____
13. 4, 8, 16, 32 → _____
14. 88, 44, 22, 11 → _____
15. 15, 30, 60, 120 → _____

Part D: Word Problems

16. A bakery had 120 cupcakes. They sell half their stock each hour. How many cupcakes are left after 3 hours?

After 1 hour: _____ After 2 hours: _____ After 3 hours: _____

17. A water tank holds 256 liters. If half drains out each day, how much water is left after 4 days?

Day 1: _____ Day 2: _____ Day 3: _____ Day 4: _____

Part E: Challenge Questions

18. What is half of 84? _____
19. If you halve 50 three times, what number do you get? _____
20. Circle the pattern that shows halving:

A) 6, 12, 24, 48 B) 48, 24, 12, 6 C) 10, 20, 30, 40

Worksheet 3: Mixed Doubling and Halving Patterns

Part A: Identify and Continue the Pattern

Directions: Write "D" for Doubling or "H" for Halving, then complete the pattern.

1. 7, 14, 28, 56, _____, _____ → Pattern: _____
2. 96, 48, 24, 12, _____, _____ → Pattern: _____
3. 11, 22, 44, 88, _____, _____ → Pattern: _____
4. 144, 72, 36, 18, _____, _____ → Pattern: _____
5. 9, 18, 36, 72, _____, _____ → Pattern: _____

Part B: Create the Opposite Pattern

Directions: If the pattern shows doubling, create a halving pattern. If it shows halving, create a doubling pattern.

6. Given: 5, 10, 20, 40 (Doubling)
   Create: 40, _____, _____, _____ (Halving)
7. Given: 112, 56, 28, 14 (Halving)
   Create: 14, _____, _____, _____ (Doubling)
8. Given: 13, 26, 52, 104 (Doubling)
   Create: 104, _____, _____, _____ (Halving)

Part C: Fill in All Missing Numbers

Directions: Complete these patterns by finding all missing numbers.

9. 6, _____, 24, _____, 96, _____
10. 200, 100, _____, _____, 12.5, _____
11. _____, 17, _____, 68, _____, 272

Part D: Pattern Problem Solving

12. Which number comes next in this pattern: 4, 8, 16, 32, 64, _____?
13. Which number comes before this pattern: _____, 19, 38, 76, 152?
14. Complete the pattern: 128, 64, _____, 16, _____, 4
15. What is the 6th number in this doubling pattern starting from 3?
    3, _____, _____, _____, _____, _____

Part E: Real-World Applications

16. A social media post gets shared by 8 people. Each person shares it with 2 others (doubling). How many people see it after 3 rounds of sharing?

Round 1: _____ Round 2: _____ Round 3: _____

17. A chocolate bar has 64 pieces. You break it in half repeatedly. How many pieces are in each section after 3 breaks?

Break 1: _____ Break 2: _____ Break 3: _____

18. A bacteria culture doubles every hour. Starting with 25 bacteria, how many are there after 4 hours?

Hour 1: _____ Hour 2: _____ Hour 3: _____ Hour 4: _____

Worksheet 4: Advanced Doubling and Halving Algorithms

Part A: Multi-Step Patterns

Directions: Follow the pattern rule and complete the sequence.

1. Rule: Start at 2, double 5 times
   2, _____, _____, _____, _____, _____
2. Rule: Start at 320, halve 5 times
   320, _____, _____, _____, _____, _____

Part B: Two-Step Patterns

Directions: Complete these patterns that use both doubling AND halving.

5. 8 → double → _____ → double → _____ → halve → _____ → halve → _____
6. 100 → halve → _____ → halve → _____ → double → _____ → double → _____

Part C: Pattern Rules

Directions: Look at each pattern and write the rule in words.

8. 3, 6, 12, 24, 48
   Rule: _____
9. 160, 80, 40, 20, 10
   Rule: _____

Part D: Comparative Patterns

Directions: Complete both patterns and answer the question.

11. Pattern A: 4, 8, 16, _____, _____
    Pattern B: 64, 32, 16, _____, _____
    Which pattern reaches 128 first? _____
12. Pattern A: 6, 12, 24, _____, _____
    Pattern B: 96, 48, 24, _____, _____
    At which number do both patterns meet? _____

Part E: Problem Solving with Algorithms

13. You have $16. Your money doubles every week for 3 weeks. How much do you have at the end?

Week 1: $_____ Week 2: $_____ Week 3: $_____

14. A game character starts with 256 health points. It loses half its health each round. What's the health after 5 rounds?

Round 1: _____ Round 2: _____ Round 3: _____ Round 4: _____ Round 5: _____

Part F: Find the Starting Number

Directions: Work backwards to find the starting number.

16. _____ → double → 18 → double → 36
17. _____ → halve → 45 → halve → 22.5

Part G: True or False

19. Doubling a number 3 times is the same as multiplying it by 8. _____
20. Halving a number 2 times is the same as dividing it by 4. _____

Worksheet 5:Pattern Recognition and Prediction

Part A: Predict the Next Three Numbers

Directions: Study each pattern and predict the next three numbers.

1. 1, 2, 4, 8, 16, _____, _____, _____
2. 500, 250, 125, 62.5, _____, _____, _____
3. 14, 28, 56, 112, _____, _____, _____
4. 288, 144, 72, 36, _____, _____, _____

Part B: Find the Pattern Rule

Directions: Write whether each pattern uses "×2" (doubling) or "÷2" (halving).

5. 20, 40, 80, 160 → _____
6. 192, 96, 48, 24 → _____
7. 25, 50, 100, 200 → _____
8. 136, 68, 34, 17 → _____

Part C: Complete the Table

Directions: Fill in the missing numbers in these doubling and halving tables.

9. Doubling Table

Start	×2	×2	×2	×2
11	22	44	___	___
16	___	64	___	256
___	26	___	104	___

10. Halving Table

Start	÷2	÷2	÷2	÷2
240	120	___	30	___
___	84	42	___	10.5
400	___	100	___	25

Part D: Pattern Sequences

Directions: Complete these longer pattern sequences.

11. 2, 4, 8, 16, _____, _____, _____, _____, _____
12. 1024, 512, 256, _____, _____, _____, _____, _____
13. 3, 6, 12, 24, _____, _____, _____, _____

Part E: Number Relationships

Directions: Answer these questions about number relationships in patterns.

14. In a doubling pattern, if the 3rd number is 28, what is the 1st number? _____
15. In a halving pattern, if the 4th number is 9, what is the 1st number? _____
16. If you double 45 twice, what number do you get? _____
17. If you halve 176 three times, what number do you get? _____

Part F: Pattern Creation Challenge

Worksheet 6: Real-World Doubling and Halving Applications

Part A: Money Patterns

Directions: Solve these money problems using doubling and halving.

1. You save $12 in Week 1. Each week you save double the previous week. How much do you save in Week 5?

Week 1: $_____ Week 2: $_____ Week 3: $_____ Week 4: $_____ Week 5: $_____

2. You have $400 and spend half each month. How much is left after 4 months?

Month 1: $_____ Month 2: $_____ Month 3: $_____ Month 4: $_____

Part B: Growth and Decay Patterns

Directions: Use doubling or halving to solve these real-world problems.

3. A town's population is 8,000. It doubles every 10 years. What will the population be in 30 years?

10 years: _____ 20 years: _____ 30 years: _____

4. A radioactive substance has 256 grams. Half decays each year. How much remains after 4 years?

Year 1: _____ Year 2: _____ Year 3: _____ Year 4: _____

5. A virus infects 5 computers. Each infected computer infects 2 more (doubling). How many are infected after 4 rounds?

Round 1: _____ Round 2: _____ Round 3: _____ Round 4: _____

Part C: Measurement Patterns

Directions: Apply doubling and halving to measurement problems.

6. A recipe calls for 3 cups of flour. If you double the recipe 3 times, how much flour do you need?

×2: _____ cups ×2: _____ cups ×2: _____ cups

7. A ribbon is 144 cm long. You cut it in half repeatedly. What's the length after 4 cuts?

Cut 1: _____ cm Cut 2: _____ cm Cut 3: _____ cm Cut 4: _____ cm

8. A container holds 80 liters of water. You pour out half each time. How much remains after 3 pours?

Pour 1: _____ L Pour 2: _____ L Pour 3: _____ L

Part D: Sports and Games

Directions: Use pattern thinking to solve these problems.

9. A tournament starts with 128 teams. Half are eliminated each round. How many teams are left after 5 rounds?

Round 1: _____ Round 2: _____ Round 3: _____ Round 4: _____ Round 5: _____

10. You score 6 points in Level 1 of a game. Your score doubles each level. What's your score at Level 6?

L1: _____ L2: _____ L3: _____ L4: _____ L5: _____ L6: _____

Part E: Nature and Science

11. A plant cell divides in two (doubling) every hour. Starting with 1 cell, how many cells are there after 6 hours?

1h: _____ 2h: _____ 3h: _____ 4h: _____ 5h: _____ 6h: _____

12. The brightness of a light halves every meter you move away. Starting at 800 lumens, what's the brightness at 4 meters?

1m: _____ 2m: _____ 3m: _____ 4m: _____

Part F: Multi-Step Word Problems

13. A library has 64 books on a shelf. On Monday, half are borrowed. On Tuesday, the remaining books double when new books arrive. On Wednesday, half are borrowed again. How many books are on the shelf?

Monday: _____ Tuesday: _____ Wednesday: _____

14. You have 18 stickers. You give away half to your friend. The next day, you buy double what you have left. Then you give away half again. How many stickers do you have?

After giving: _____ After buying: _____ After giving again: _____

15. A baker makes 20 cookies. The number doubles each hour for 3 hours. Then half are sold each hour for 2 hours. How many cookies remain?

After doubling (3h): _____ → _____ → _____

After selling (2h): _____ → _____

Part G: Challenge Problems

16. If you start with 1 and double it 10 times, what number do you reach? _____
17. Create your own word problem using a halving pattern (write the problem and solve it):

Problem: _____

Solution: _____

18. Explain in your own words why doubling and halving are opposite operations: