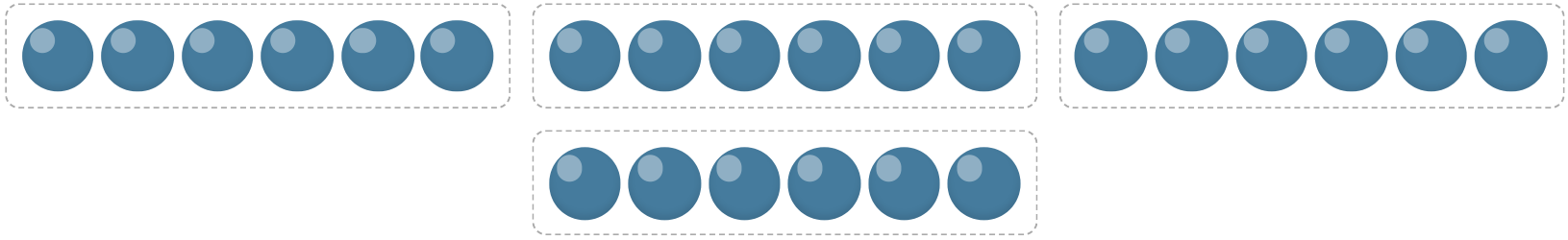
1. Multiplication Comparison

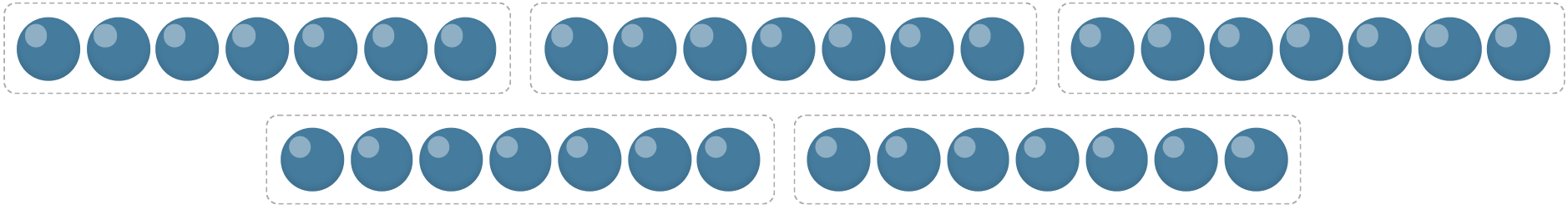
a)



4 × 6 = _____

24 is 4 groups of 6, or 4 times 6

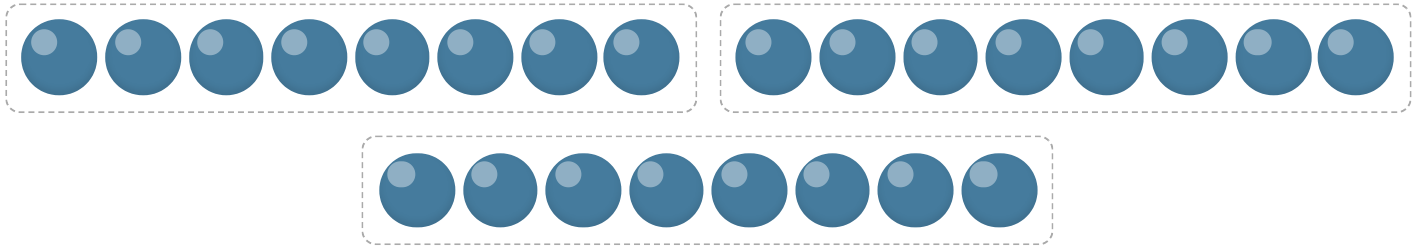
b)



5 × 7 = _____

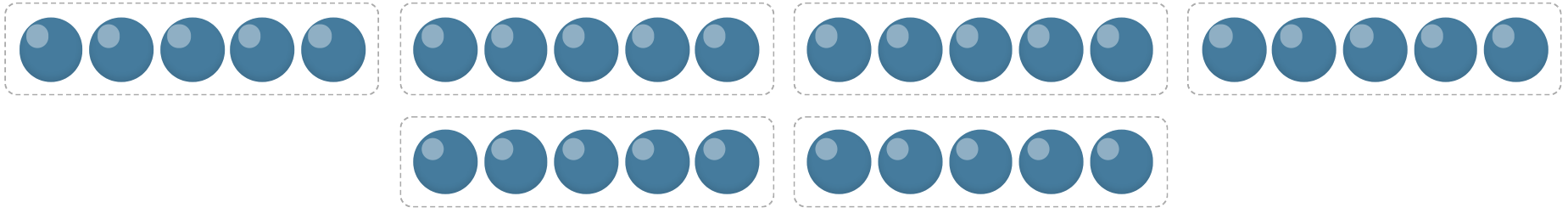
1. Multiplication Comparison

c)



$3 \times 8 =$ _____

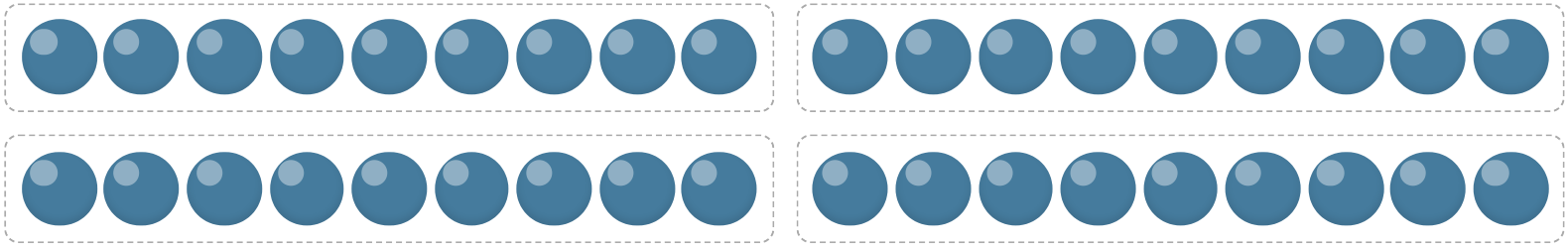
d)



$6 \times 5 =$ _____

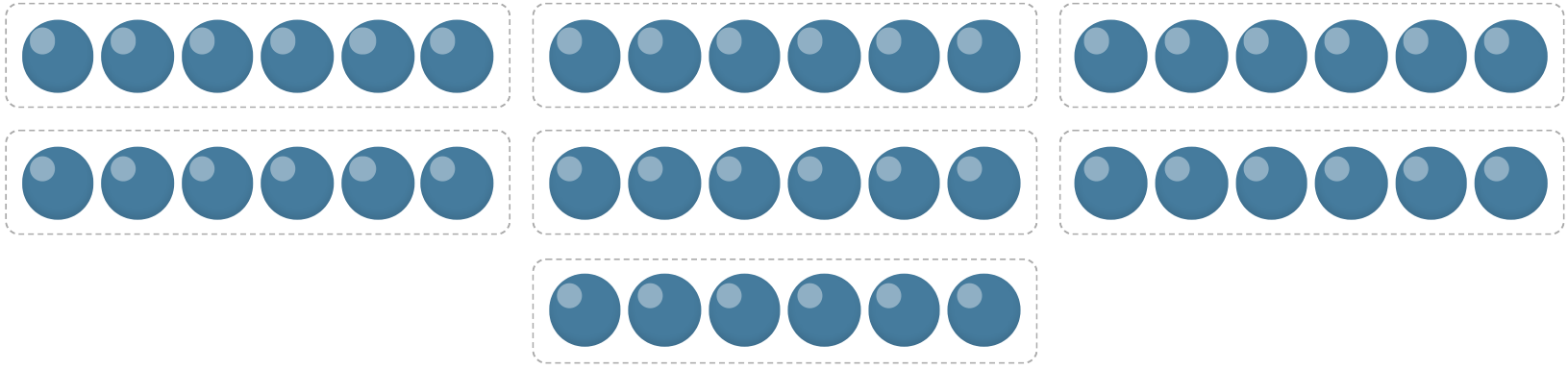
1. Multiplication Comparison

e)



$$4 \times 9 = \_\_\_\_$$

f)



$$7 \times 6 = \_\_\_\_$$

2. Place Value to Millions

a)

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
3	5	7	4	2	6

300,000 + 50,000 + 7,000 + 400 + 20 + 6

b)

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
2	4	8	3	1	5

200,000 + 40,000 + 8,000 + 300 + 10 + 5

c)

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
6	1	3	7	0	4

600,000 + 10,000 + 3,000 + 700 + 0 + 4

2. Place Value to Millions

d)

9	0	5	2	0	8
Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

900,000 + 0 + 5,000 + 200 + 0 + 8

e)

4	7	2	0	3	9
Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

400,000 + 70,000 + 2,000 + 0 + 30 + 9

f)

1	5	0	6	0	0
Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones

100,000 + 50,000 + 0 + 600 + 0 + 0

3. Reading, Writing, and Comparing Multi-Digit Numbers

a)

$$52{,}847 = 50{,}000 + 2{,}000 + 800 + 40 + 7$$

$$52{,}748 = 50{,}000 + 2{,}000 + 700 + 40 + 8$$

$$52{,}847 > 52{,}748$$

Thousands: 800 > 700, so 52,847 > 52,748

b)

$$38{,}216 = \square + \square + \square + \square + \square$$

$$37{,}916 = \square + \square + \square + \square + \square$$

$$38{,}216 \;\square\; 37{,}916$$

3. Reading, Writing, and Comparing Multi-Digit Numbers

c)

64,503 = ____ + ____ + ____ + ____ + ____

64,530 = ____ + ____ + ____ + ____ + ____

64,503 ____ 64,530

d)

71,284 = ____ + ____ + ____ + ____ + ____

71,824 = ____ + ____ + ____ + ____ + ____

71,284 ____ 71,824

3. Reading, Writing, and Comparing Multi-Digit Numbers

e)

95,600 = ____ + ____ + ____ + ____ + ____

95,060 = ____ + ____ + ____ + ____ + ____

95,600 ____ 95,060

f)

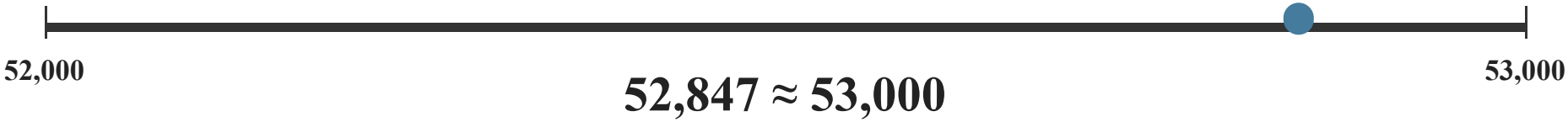
82,019 = ____ + ____ + ____ + ____ + ____

82,109 = ____ + ____ + ____ + ____ + ____

82,019 ____ 82,109

4. Rounding Multi-Digit Numbers

a)



52,847 ≈ 53,000

b)

37,421 ≈ _____

4. Rounding Multi-Digit Numbers

c)

68,000 **69,000**

68,359 ≈ _____

d)

14,000 **15,000**

14,583 ≈ _____

4. Rounding Multi-Digit Numbers

e)

82,607 ≈ _____

f)

29,145 ≈ _____

5. Multi-Digit Addition

a)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
	3	5	2	4	7
+	2	3	1	2	5
	5	8	3	7	2

35,247 + 23,125 = 58,372

b)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
	4	6	1	3	8
+	3	2	5	4	1

5. Multi-Digit Addition

c)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
	5	7	3	0	6
+	2	1	4	3	2

d)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
	6	2	4	8	9
+	3	1	5	0	7

5. Multi-Digit Addition

e)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
	7	1	0	5	3
+	2	8	3	4	6

f)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
	8	3	9	2	0
+	1	5	0	7	8

6. Multi-Digit Subtraction

a)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
	6	8	4	3	7
-	2	3	1	2	5
	4	5	3	1	2

68,437 - 23,125 = 45,312

b)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
	7	5	6	2	8
-	3	2	1	4	6

6. Multi-Digit Subtraction

c)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
	9	4	3	8	5
-	5	2	1	0	3

d)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
	8	2	7	5	0
-	4	1	3	2	0

6. Multi-Digit Subtraction

e)

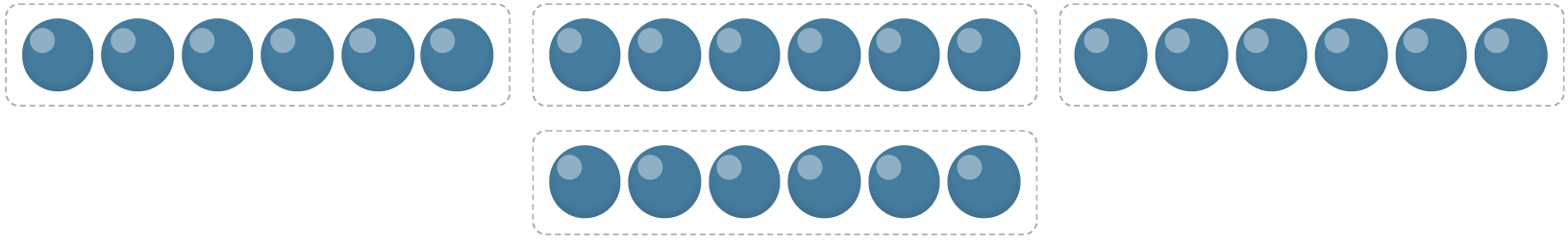
	Ten Thousands	Thousands	Hundreds	Tens	Ones
	6	5	9	3	4
-	2	3	0	1	2

f)

	Ten Thousands	Thousands	Hundreds	Tens	Ones
	9	8	1	0	7
-	4	5	2	0	3

7. Multiplication Comparison

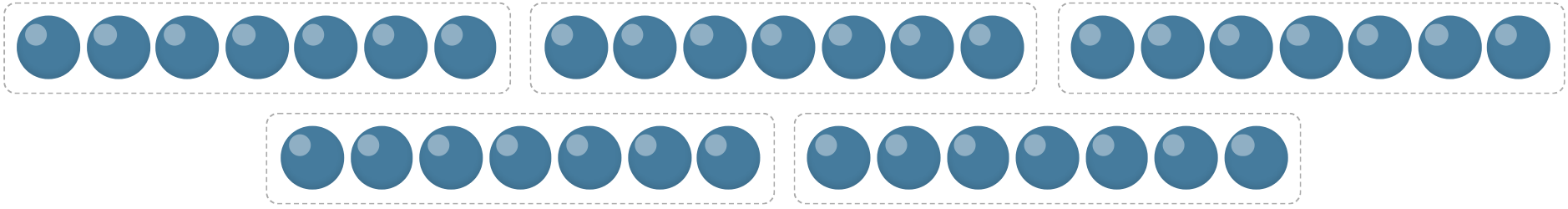
a)



24 is how many times 6?

4 times

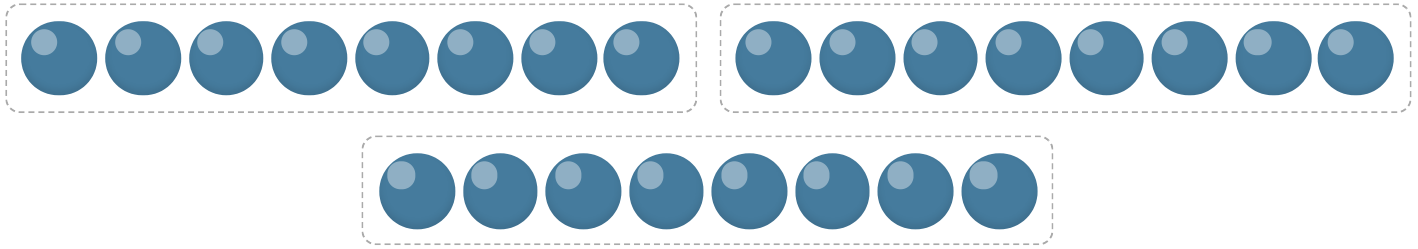
b)



35 is how many times 7?

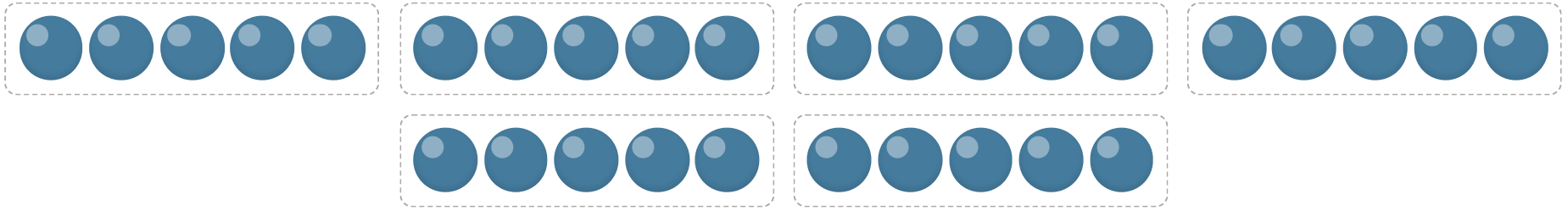
7. Multiplication Comparison

c)



24 is how many times 8?

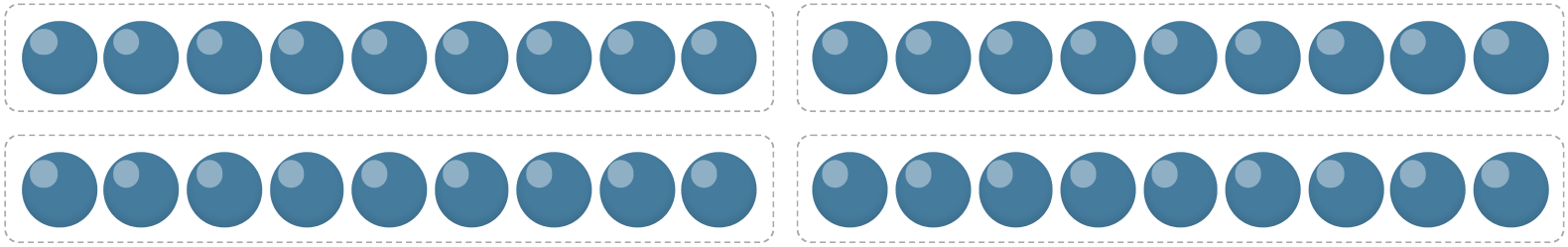
d)



30 is how many times 5?

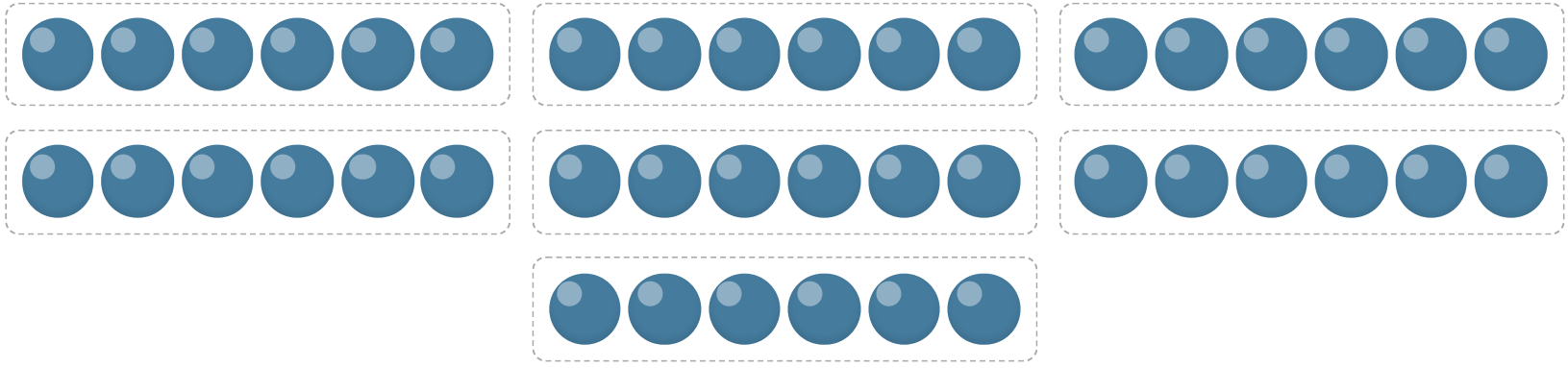
7. Multiplication Comparison

e)



36 is how many times 9?

f)



42 is how many times 6?

8. Multi-Step Problems

a)

3 boxes of pencils, 8 in each box, then bought 5 more. How many pencils in total?

29 pencils

3×8=24, 24+5=29

b)

4 bags of cookies, 6 in each bag, ate 7 cookies. How many cookies are left?

8. Multi-Step Problems

c)

5 rows of chairs, 9 in each row, then brought 8 more. How many chairs in total?

d)

2 boxes of apples, 12 in each box, divided among 6 children. How many apples per child?

8. Multi-Step Problems

e)

6 bags of candy, 7 in each bag, then bought 4 more. How many pieces of candy in total?

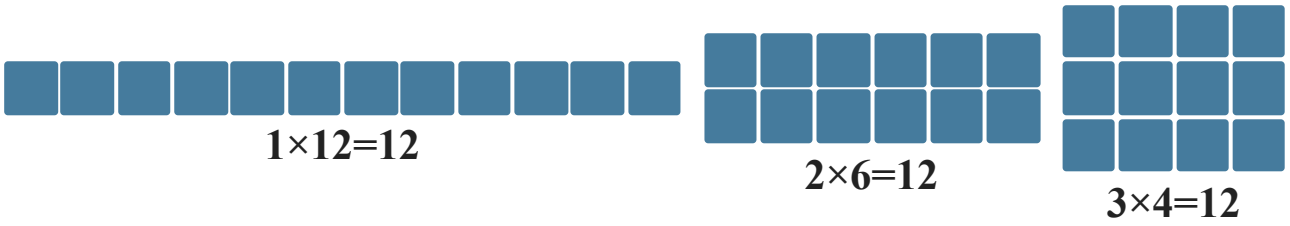
f)

3 boxes of colored pencils, 10 in each box, gave 8 to a friend. How many pencils are left?

9. Factors and Multiples

a)

12

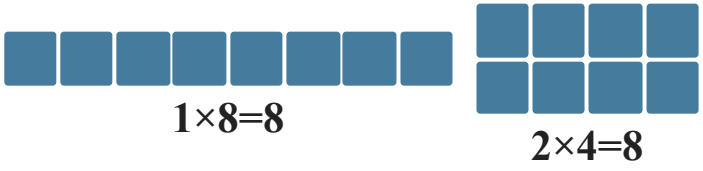


Composite

Factors: 1,2,3,4,6,12

b)

8



Prime/Composite

c)

15

1×15=15

3×5=15

Prime/Composite

d)

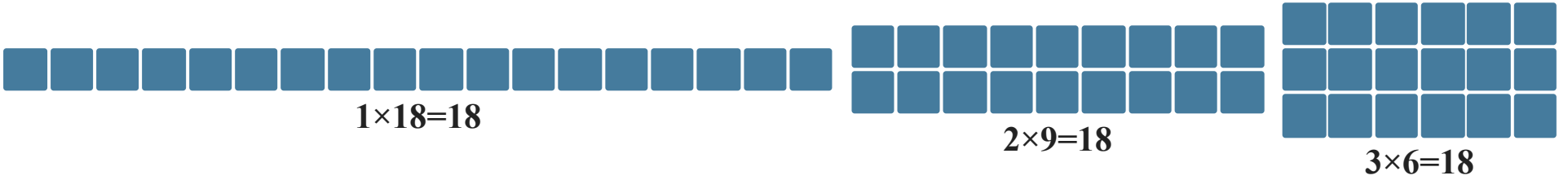
7

1×7=7

Prime/Composite

e)

18



1×18=18 **2×9=18** **3×6=18**

Prime/Composite

f)

11

1×11=11

Prime/Composite

10. Number Patterns

a)

1 → 4 → 7 → 10 → 13 → 16

Increasing by **3**

Odd 3 **Even** 3

b)

2 → 7 → 12 → 17 → 22 →

Increasing by

Odd **Even**

10. Number Patterns

c)

3 → 7 → 11 → 15 → 19 → ____

Increasing by ____

Odd ____ Even ____

d)

5 → 11 → 17 → 23 → 29 → ____

Increasing by ____

Odd ____ Even ____

10. Number Patterns

e)

4 → 11 → 18 → 25 → 32 →

Increasing by

Odd Even

f)

6 → 14 → 22 → 30 → 38 →

Increasing by

Odd Even

11. Single-Digit × Multi-Digit

a)

$$2\,8\,4\,7 \times 3$$

Method 1: Repeated Addition

$$2847 + 2847 + 2847$$

$$= 8541$$

Method 2: Decomposition

$$2847 = 2000 + 800 + 40 + 7$$

$$2000 \times 3 = 6000 \quad 800 \times 3 = 2400 \quad 40 \times 3 = 120 \quad 7 \times 3 = 21$$

$$6000 + 2400 + 120 + 21 = 8541$$

Method 3: Vertical Algorithm

$$\begin{array}{r} 2\ \ 8\ \ 4\ \ 7 \\ \times\ \ \ \ 3 \\ \hline 8\ \ 5\ \ 4\ \ 1 \end{array}$$

11. Single-Digit × Multi-Digit

b)

$$3625 \times 2$$

Method 1: Repeated Addition

$$\square + \square + \square$$
$$= \square$$

Method 2: Decomposition

$$3625 = \square + \square + \square + \square$$
$$\square \times 2 = \square \quad \square \times 2 = \square \quad \square \times 2 = \square \quad \square \times 2 = \square$$
$$\square + \square + \square + \square = \square$$

Method 3: Vertical Algorithm

$$\begin{array}{r} 3\ 6\ 2\ 5 \\ \times\ \ 2 \\ \hline \end{array}$$

11. Single-Digit × Multi-Digit

c)

4 1 7 3 × 4

Method 1: Repeated Addition

____ + ____ + ____

= ____

Method 2: Decomposition

4173 = ____ + ____ + ____ + ____

____ ×4= ____ ____ ×4= ____ ____ ×4= ____ ____ ×4= ____

____ + ____ + ____ + ____ = ____

Method 3: Vertical Algorithm

```
  4  1  7  3
  ×  4
-------------
```

11. Single-Digit × Multi-Digit

d)

5 2 0 6 × 3

Method 1: Repeated Addition

____ + ____ + ____

= ____

Method 2: Decomposition

5206 = ____ + ____ + ____ + ____

____ ×3= ____ ____ ×3= ____ ____ ×3= ____ ____ ×3= ____

____ + ____ + ____ + ____ = ____

Method 3: Vertical Algorithm

5 2 0 6

× **3**

---

11. Single-Digit × Multi-Digit

e)

$$6384 \times 2$$

Method 1: Repeated Addition

$$\square + \square + \square = \square$$

Method 2: Decomposition

$$6384 = \square + \square + \square + \square$$

$$\square \times 2 = \square \quad \square \times 2 = \square \quad \square \times 2 = \square \quad \square \times 2 = \square$$

$$\square + \square + \square + \square = \square$$

Method 3: Vertical Algorithm

$$\begin{array}{r} 6\ 3\ 8\ 4 \\ \times\ \ \ 2 \\ \hline \end{array}$$

11. Single-Digit × Multi-Digit

f)

$$7\,4\,1\,9 \times 5$$

Method 1: Repeated Addition

$$\square + \square + \square = \square$$

Method 2: Decomposition

$$7419 = \square + \square + \square + \square$$

$$\square \times 5 = \square \quad \square \times 5 = \square \quad \square \times 5 = \square \quad \square \times 5 = \square$$

$$\square + \square + \square + \square = \square$$

Method 3: Vertical Algorithm

$$\begin{array}{r} 7\;\;4\;\;1\;\;9 \\ \times\;\;\;\;\;\;5 \\ \hline \end{array}$$

12. Two-Digit × Two-Digit

a)

$$23 \times 14$$

Method 1: Decompose Both

$$23 = 20 + 3 \qquad 14 = 10 + 4$$

$$(20 + 3) \times (10 + 4)$$

$$20 \times 10 = 200 \qquad 3 \times 10 = 30 \qquad 20 \times 4 = 80 \qquad 3 \times 4 = 12$$

$$200 + 30 + 80 + 12 = 322$$

Method 2: Decompose One

$$14 = 10 + 4$$

$$23 \times (10 + 4)$$

$$23 \times 10 = 230 \qquad 23 \times 4 = 92$$

$$230 + 92 = 322$$

12. Two-Digit × Two-Digit

b)

$$32 \times 21$$

Method 1: Decompose Both

$32 = \square + \square$ $\quad$ $21 = \square + \square$

$\square \times \square = \square$ $\quad$ $\square \times \square = \square$ $\quad$ $\square \times \square = \square$ $\quad$ $\square \times \square = \square$

$\square + \square + \square + \square = \square$

Method 2: Decompose One

$21 = \square + \square$

$32 \times \square = \square$ $\quad$ $32 \times \square = \square$

$\square + \square = \square$

12. Two-Digit × Two-Digit

c)

41 × 23

Method 1: Decompose Both

41 = ☐ + ☐ 23 = ☐ + ☐

☐ × ☐ = ☐ ☐ × ☐ = ☐ ☐ × ☐ = ☐ ☐ × ☐ = ☐

☐ + ☐ + ☐ + ☐ = ☐

Method 2: Decompose One

23 = ☐ + ☐

41× ☐ = ☐ 41× ☐ = ☐

☐ + ☐ = ☐

12. Two-Digit × Two-Digit

d)

34 × 22

Method 1: Decompose Both

34 = ☐ + ☐ 22 = ☐ + ☐

☐ × ☐ = ☐ ☐ × ☐ = ☐ ☐ × ☐ = ☐ ☐ × ☐ = ☐

☐ + ☐ + ☐ + ☐ = ☐

Method 2: Decompose One

22 = ☐ + ☐

34× ☐ = ☐ 34× ☐ = ☐

☐ + ☐ = ☐

12. Two-Digit × Two-Digit

e)

52 × 13

Method 1: Decompose Both

52 = ☐ + ☐ 13 = ☐ + ☐

☐ × ☐ = ☐ ☐ × ☐ = ☐ ☐ × ☐ = ☐ ☐ × ☐ = ☐

☐ + ☐ + ☐ + ☐ = ☐

Method 2: Decompose One

13 = ☐ + ☐

52× ☐ = ☐ 52× ☐ = ☐

☐ + ☐ = ☐

12. Two-Digit × Two-Digit

f)

63 × 11

Method 1: Decompose Both

63 = ☐ + ☐ 11 = ☐ + ☐

☐ × ☐ = ☐ ☐ × ☐ = ☐ ☐ × ☐ = ☐ ☐ × ☐ = ☐

☐ + ☐ + ☐ + ☐ = ☐

Method 2: Decompose One

11 = ☐ + ☐

63× ☐ = ☐ 63× ☐ = ☐

☐ + ☐ = ☐

13. Division with Remainders

a)

$$23 \div 5$$

Decomposition

$23 = 20 + 3$

$(20 + 3) \div 5$

$20 \div 5 = 4 \quad 3$ R:

Grouping Diagram

$23 \div 5 = 4$ R: 3

b)

$$19 \div 4$$

Decomposition

19 = ☐ + ☐

☐ ÷4= ☐ ☐ R:

Grouping Diagram

19 ÷ 4 = ☐ R: ☐

13. Division with Remainders

c)

$$31 \div 6$$

Decomposition

$31 =$ ☐ $+$ ☐

☐ $\div 6 =$ ☐ ☐ **R:**

Grouping Diagram

$31 \div 6 =$ ☐ **R:** ☐

d)

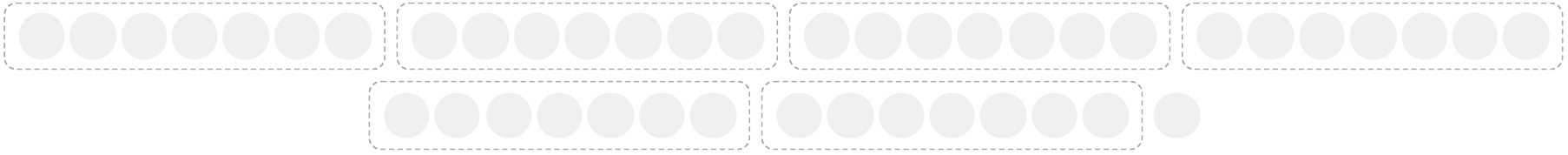
$$43 \div 7$$

Decomposition

43 = ☐ + ☐

☐ ÷7= ☐ ☐ R:

Grouping Diagram



43 ÷ 7 = ☐ R: ☐

13. Division with Remainders

e)

$$29 \div 8$$

Decomposition

$29 =$ ☐ $+$ ☐

☐ $\div 8 =$ ☐ ☐ **R:**

Grouping Diagram

$29 \div 8 =$ ☐ **R:** ☐

f)

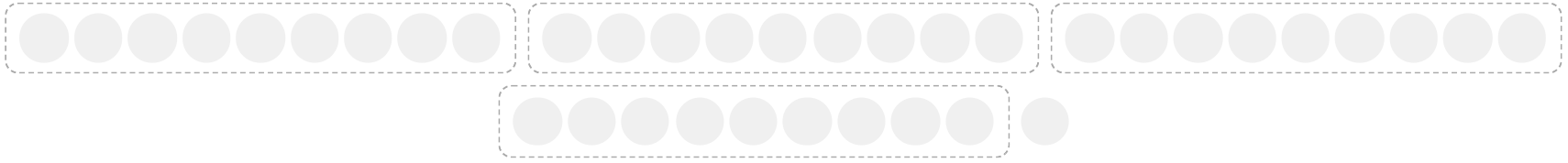
$$37 \div 9$$

Decomposition

$37 =$ ☐ + ☐

☐ ÷9= ☐ ☐ R:

Grouping Diagram



$37 \div 9 =$ ☐ R: ☐

14. Definition and Basic Properties of Fractions

a) Today we answer a question: What exactly is a fraction?

Definition of a Fraction

Define A/B defined as:

The number that, multiplied by B, equals A

That is: $B \times (A/B) = A$

Example: Use the definition to understand 1/2

1/2 is the number that, multiplied by **2**, equals **1**

That is: $2 \times 1/2 = 1$

1/2

Two 1/2 pieces together = 1

$2 \times 1/2 = 1$ ✓

Axioms we already know (no proof needed)

① Commutative law: $x \times y = y \times x$

② Associative law: $(x \times y) \times z = x \times (y \times z)$

③ Identity: $x \times 1 = x$

④ Reciprocal: $b \times (1/b) = 1$ (when $b \neq 0$)

b) Core property proof: A/B = (A×C)/(B×C)

Step 1 Let **x = A/B**, by fraction definition:

$$B \times x = A$$

Step 2 Multiply both sides by **C**:

$$(B \times x) \times C = A \times C$$

Step 3 Rearrange using associative law:

$$(B \times C) \times x = A \times C$$

(Associative law: first multiply B×x then C = first multiply B×C then multiply x)

Step 4 By definition of fractions, if a number **x** satisfies

$$(B \times C) \times x = A \times C$$

then **x** is **(A×C)/(B×C)**

Conclusion **A/B = (A×C)/(B×C)**

c) Use the proven property to derive equivalent fractions

1/2 = **(1×2)/(2×2)** = **2/4**

1/2 = **(1×3)/(2×3)** = **3/6**

Fraction bars verify: 1/2 = 2/4 = 3/6

1/2 = 2/4 = 3/6 ✓

Practice: Complete the derivation

d) 1/3 = (1×)/(3×) = /6

e) 2/3 = (2×)/(3×) = /6

f) 3/4 = (3×)/(4×) = /8

15. Equivalent Fractions

a)

In Lesson 14 we proved:

A/B = (A×C)/(B×C)

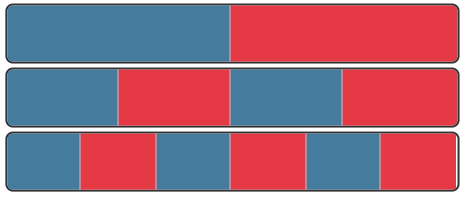
1/2 = (1×2)/(2×2) = 2/4

1/2 = (1×3)/(2×3) = 3/6

1/2

2/4

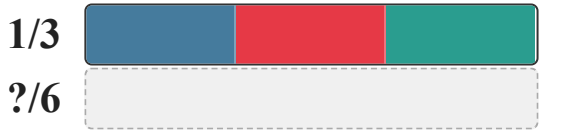
3/6



1/2 = 2/4 = 3/6 ✓

b)

$$1/3 = (1\times\ \ )/(3\times\ \ ) = \frac{\ \ }{\ \ }$$



c)

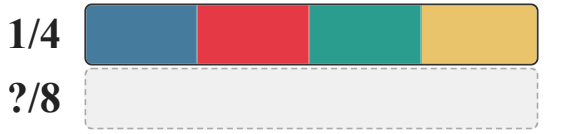
$$2/3 = (2\times\ \ )/(3\times\ \ ) = \frac{\ \ }{\ \ }$$

d)

$$3/4 = (3\times\ \ )/(4\times\ \ ) = \frac{\ \ }{\ \ }$$

e)

$$1/4 = (1\times\ \ )/(4\times\ \ ) = \frac{\ \ }{\ \ }$$



f)

$$2/5 = (2\times\ \ )/(5\times\ \ ) = \frac{\ \ }{\ \ }$$

16. Comparing Fractions

a) Compare 2/3 and 3/4

Core Idea:**Convert** —— when numerators and denominators differ → make one side the same

Method 1: Make denominators the same

$2/3 = (2\times4)/(3\times4) = 8/12$

$3/4 = (3\times3)/(4\times3) = 9/12$

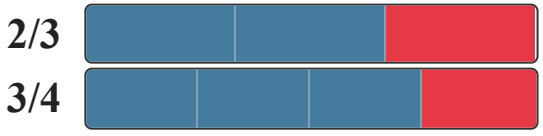
$8/12 < 9/12$, so $2/3 < 3/4$

Method 2: Make numerators the same

$2/3 = (2\times3)/(3\times3) = 6/9$

$3/4 = (3\times2)/(4\times2) = 6/8$

Same numerator, smaller denominator = larger fraction, $6/9 < 6/8$, so $2/3 < 3/4$



2/3 < 3/4

b) Compare 4/7 and 3/5

Method 1: Make denominators the same

$4/7 = (4\times\ \ )/(7\times\ \ ) =$

$3/5 = (3\times\ \ )/(5\times\ \ ) =$

Method 2: Make numerators the same

$4/7 = (4\times\ \ )/(7\times\ \ ) =$

$3/5 = (3\times\ \ )/(5\times\ \ ) =$

$4/7 \quad \square \quad 3/5$

c) Compare 5/6 and 7/8

Method 1: Make denominators the same

$5/6 = (5\times\ \ )/(6\times\ \ ) =$

$7/8 = (7\times\ \ )/(8\times\ \ ) =$

Method 2: Make numerators the same

$5/6 = (5\times\ \ )/(6\times\ \ ) =$

$7/8 = (7\times\ \ )/(8\times\ \ ) =$

$5/6 \quad \square \quad 7/8$

d) Compare 3/8 and 2/5

Method 1: Make denominators the same

$$3/8 = (3\times\ \ )/(8\times\ \ ) = \ \ $$
$$2/5 = (2\times\ \ )/(5\times\ \ ) = \ \ $$

Method 2: Make numerators the same

$$3/8 = (3\times\ \ )/(8\times\ \ ) = \ \ $$
$$2/5 = (2\times\ \ )/(5\times\ \ ) = \ \ $$

$$3/8 \ \ \ 2/5$$

e) Compare 4/9 and 5/12

Method 1: Make denominators the same

$$4/9 = (4\times\quad)/(9\times\quad) = \quad$$
$$5/12 = (5\times\quad)/(12\times\quad) = \quad$$

Method 2: Make numerators the same

$$4/9 = (4\times\quad)/(9\times\quad) = \quad$$
$$5/12 = (5\times\quad)/(12\times\quad) = \quad$$

$$4/9 \quad 5/12$$

f) Xiao Ming ate 2/5 cakes, Xiao Hong ate 3/7 cakes, who ate more?

Method 1: Make denominators the same

2/5 = (2×)/(5×) =

3/7 = (3×)/(7×) =

Method 2: Make numerators the same

2/5 = (2×)/(5×) =

3/7 = (3×)/(7×) =

2/5 ☐ 3/7

17. Add/Subtract Fractions: Proof

a) Today we prove: how to add/subtract fractions with like denominators

What We Want to Prove

$$A/B + C/B = (A+C)/B$$

Adding like-denominator fractions: add numerators, denominator stays

Tools We Already Know

① Fraction definition: **A/B** is the number which, multiplied by **B**, equals **A**

② Lesson 14 proven: $A/B = (A \times C)/(B \times C)$

③ Reciprocal definition: $b \times (1/b) = 1$ ($b \neq 0$)

④ Distributive law: $(A+B) \times C = A \times C + B \times C$

Key Insight

Fraction **A/B** is really $A \times (1/B)$

Because A/B multiplied by B gives A, and $A \times (1/B)$ also multiplied by B gives A

17. Add/Subtract Fractions: Proof

b) Proof: A/B + C/B = (A+C)/B

Step 1 Write each fraction as **numerator × (1/denominator)**:

A/B = A × (1/B)

C/B = C × (1/B)

Step 2 Substitute into the sum:

A/B + C/B = **A × (1/B)** + **C × (1/B)**

Step 3 Factor out **(1/B)**:

= **(A + C) × (1/B)**

(distributive law: $A \times X + C \times X = (A+C) \times X$)

Step 4 Write **(A+C) × (1/B)** back as a fraction:

= (A+C)/B

Conclusion **A/B + C/B = (A+C)/B**

17. Add/Subtract Fractions: Proof

c) Verify with the Proven Formula

1/5 + 2/5 = (1+2)/5 = **3/5**

5/8 − 2/8 = (5−2)/8 = **3/8**

1/5
+ 2/5
= 3/5

1/5 + 2/5 = 3/5 ✓

Practice: Calculate Using the Formula

d) 2/7 + 3/7 = (+)/7 = /7

e) 4/9 + 3/9 = (+)/9 = /9

f) 7/12 − 4/12 = (−)/12 = /12

18. Adding and Subtracting Fractions

a)

Proven in Lesson 17: **A/B + C/B = (A+C)/B**

$$1/5 + 2/5 = (1+2)/5 = 3/5$$

$$5/8 - 2/8 = (5-2)/8 = 3/8$$

b)

$$2/7 + 3/7 = \frac{\quad}{\quad}$$

$$6/11 - 4/11 = \frac{\quad}{\quad}$$

c)

$$\frac{4}{9} + \frac{3}{9} = \frac{\quad}{\quad}$$

$$\frac{7}{12} - \frac{5}{12} = \frac{\quad}{\quad}$$

d)

$$\frac{3}{10} + \frac{4}{10} = \frac{\quad}{\quad}$$

$$\frac{8}{15} - \frac{3}{15} = \frac{\quad}{\quad}$$

e)

$$5/13 + 6/13 = \frac{\quad}{\quad}$$

$$11/16 - 7/16 = \frac{\quad}{\quad}$$

f)

Xiao Ming ate 3/8 of a cake, Xiao Hong ate 2/8 of a cake.
How much cake did they eat altogether?

$$3/8 + 2/8 = \frac{\quad}{\quad}$$

19. Mixed Numbers

a)

Mixed number = **whole number part** + **fraction part**
When adding/subtracting, calculate whole and fraction **separately**

$$2\ 3/5 + 1\ 1/5 = (2+1) + (3/5+1/5) = 3 + 4/5 = 3\ 4/5$$

$$4\ 5/8 - 2\ 3/8 = (4-2) + (5/8-3/8) = 2 + 2/8 = 2\ 2/8$$

b)

$$3\ 2/7 + 1\ 4/7 = \square + \frac{\square}{\square}$$

$$5\ 6/9 - 3\ 2/9 = \square + \frac{\square}{\square}$$

19. Mixed Numbers

c)

$6\ 4/11 + 2\ 5/11 = \square + \frac{\square}{\square}$

$7\ 8/15 - 4\ 3/15 = \square + \frac{\square}{\square}$

d)

$1\ 5/12 + 3\ 7/12 = \square + \frac{\square}{\square}$

$8\ 9/20 - 5\ 4/20 = \square + \frac{\square}{\square}$

19. Mixed Numbers

e)

$4\ 7/16 + 2\ 5/16 = \square + \frac{\square}{\square}$

$9\ 11/25 - 6\ 7/25 = \square + \frac{\square}{\square}$

f)

Xiao Ming ran 2 3/10 km, Xiao Hong ran 1 6/10 km.
How far did they run altogether?

$2\ 3/10 + 1\ 6/10 = \square + \frac{\square}{\square}$

20. Fraction × Whole Number: Proof

a) Today we prove: how to multiply a whole number by a fraction

What We Want to Prove

$$A \times (B/C) = (A \times B)/C$$

Whole number × fraction = (whole × numerator) / denominator

Tools We Already Know

① Fraction definition: **B/C** is the number which, multiplied by **C**, equals **B**

② Key insight: $B/C = B \times (1/C)$

③ Associative law of multiplication: $(A \times B) \times C = A \times (B \times C)$

④ Lesson 17 proven: $A/C + B/C = (A+B)/C$

Intuitive Understanding

$3 \times 2/5$ means 3 groups of **2/5** added together

$= 2/5 + 2/5 + 2/5$

$= (2+2+2)/5 = 6/5$

But we need a rigorous proof, not relying on the intuition of "adding together"

20. Fraction × Whole Number: Proof

b) Proof: $A \times (B/C) = (A \times B)/C$

Step 1 Write the fraction as **numerator × (1/denominator)**:

$$B/C = B \times (1/C)$$

Step 2 Substitute into the multiplication:

$$A \times (B/C) = A \times [B \times (1/C)]$$

Step 3 Rearrange using associative law:

$$= (A \times B) \times (1/C)$$

(associative law: $A \times (B \times X) = (A \times B) \times X$)

Step 4 Write $(A \times B) \times (1/C)$ back in fraction form:

$$= (A \times B)/C$$

Conclusion $A \times (B/C) = (A \times B)/C$

20. Fraction × Whole Number: Proof

c) Verify Using the Proven Formula

3 × 2/5 = (3×2)/5 = **6/5**

4 × 3/8 = (4×3)/8 = 12/8 = **3/2**

2 × 7/10 = (2×7)/10 = 14/10 = **7/5**

Practice: Calculate Using the Formula

d) 5 × 3/7 = (5 ×) / 7 = /7

e) 6 × 4/9 = (6 ×) / 9 = /9

f) 3 × 5/12 = (3 ×) / 12 = /12

21. Fraction × Whole Number

a)

Fraction × whole number = **numerator × whole number** / denominator

$$3 \times 2/7 = (3 \times 2) / 7 = 6/7$$

$$4 \times 3/10 = (4 \times 3) / 10 = 12/10$$

b)

$$2 \times 4/9 = \frac{\quad}{\quad}$$

$$5 \times 2/11 = \frac{\quad}{\quad}$$

21. Fraction × Whole Number

c)

$$3 \times 5/12 = \frac{\quad}{\quad}$$

$$6 \times 3/8 = \frac{\quad}{\quad}$$

d)

$$4 \times 7/15 = \frac{\quad}{\quad}$$

$$8 \times 3/20 = \frac{\quad}{\quad}$$

21. Fraction × Whole Number

e)

$$7 \times 2/9 = \frac{\quad}{\quad}$$

$$9 \times 5/14 = \frac{\quad}{\quad}$$

f)

Xiao Ming drinks 2/5 L of milk each day.
How much does he drink in 4 days?

$$4 \times 2/5 = \frac{\quad}{\quad}$$

22. Fractions with Denominators 10 and 100

a)

Denominator 10 → Denominator 100: **multiply numerator and denominator by 10**

$$\frac{3}{10} = \frac{(3\times10)}{(10\times10)} = \frac{30}{100}$$

$$\frac{7}{10} = \frac{(7\times10)}{(10\times10)} = \frac{70}{100}$$

b)

$$\frac{4}{10} = \frac{\quad}{\quad}$$

$$\frac{9}{10} = \frac{\quad}{\quad}$$

22. Fractions with Denominators 10 and 100

c)

$$\frac{1}{10} = \frac{\square}{\square}$$

$$\frac{6}{10} = \frac{\square}{\square}$$

d)

$$\frac{2}{10} = \frac{\square}{\square}$$

$$\frac{8}{10} = \frac{\square}{\square}$$

22. Fractions with Denominators 10 and 100

e)

$$5/10 = \frac{\quad}{\quad}$$

$$3/10 = \frac{\quad}{\quad}$$

f)

Xiao Ming walked 7/10 kilometers,
how many hundredths of a kilometer is that?

$$7/10 = \frac{\quad}{\quad}$$

23. Decimal Representation

a)

Denominator 10 → **1 decimal place**
Denominator 100 → **2 decimal places**

3/10 = 0.3

47/100 = 0.47

9/100 = 0.09

b)

7/10 =

53/100 =

6/100 =

23. Decimal Representation

c)

$2/10 =$

$81/100 =$

$15/100 =$

d)

$9/10 =$

$34/100 =$

$2/100 =$

e)

4/10 =

99/100 =

60/100 =

f)

Xiao Ming drank 7/10 liters of water,
express this in decimal form (liters)?

7/10 =

24. Comparing Decimals

a)

Comparing decimals: first compare the **whole number part**, then compare the **decimal part** (left to right)

0.5 ? 0.3 → 5/10 ? 3/10 → 0.5 > 0.3

0.47 ? 0.52 → 47/100 ? 52/100 → 0.47 < 0.52

1.3 ? 0.9 → whole number part 1 > 0 → 1.3 > 0.9

b)

0.8 ? 0.6 → /10 ? /10 →

0.35 ? 0.28 → /100 ? /100 →

2.1 ? 1.9 → whole number part > →

24. Comparing Decimals

c)

0.4 ? 0.7 → /10 ? /10 →

0.91 ? 0.89 → /100 ? /100 →

3.6 ? 3.4 → whole number part ? →

d)

0.2 ? 0.5 → /10 ? /10 →

0.73 ? 0.77 → /100 ? /100 →

4.8 ? 5.2 → whole number part ? →

24. Comparing Decimals

e)

0.6 ? 0.9 → /10 ? /10 →

0.44 ? 0.44 → /100 ? /100 →

2.5 ? 2.05 → whole number part ? →

f)

Xiao Ming jumped 1.3 meters, Xiao Hong jumped 1.6 meters.

Who jumped farther?

1.3 ? 1.6 → whole number part ? →

25. Unit Conversions

a)

1 km = **1000** m | 1 kg = **1000** g | 1 L = **1000** mL | 1 hr = **60** min

3 km = ? m → 3 × 1000 = 3000 m

5 kg = ? g → 5 × 1000 = 5000 g

2 hr = ? min → 2 × 60 = 120 min

b)

4 km = _____ m

7 kg = _____ g

3 L = _____ mL

25. Unit Conversions

c)

6 km = ____ **m**

9 kg = ____ **g**

5 hr = ____ **min**

d)

2000 m = ____ **km**

8000 g = ____ **kg**

120 min = ____ **hr**

e)

5000 mL = ____ L

300 cm = ____ m

240 min = ____ hr

f)

Xiao Ming ran 3 km, Xiao Hong ran 2000 m.

Who ran farther?

3 km = ____ m → ____ > 2000 m

26. Measurement Word Problems

a)

Measurement word problems: first **convert to the same unit**, then calculate

A road is 2 km 500 m long,

Xiao Ming walked 1 km 800 m. How much is left?

2 km 500 m = 2500 m

1 km 800 m = 1800 m

2500 - 1800 = 700 m

b)

Xiao Hong bought 3 kg of apples and 500 g of grapes.

How many grams of fruit did she buy altogether?

3 kg = ____ g

____ + 500 = ____ g

26. Measurement Word Problems

c)

A bucket holds 5 L of water. Each cup holds 250 mL.
How many cups can be filled?

5 L = _____ mL

_____ ÷ 250 = _____ cups

d)

A movie started at 1:30 and lasted 90 minutes.
What time did the movie end?

90 min = _____ hr _____ min

1:30 + _____ hr _____ min = _____

26. Measurement Word Problems

e)

A rope is 4 m 60 cm long.
After cutting off 1 m 80 cm, how much is left?

4 m 60 cm = ____ cm

1 m 80 cm = ____ cm

____ - ____ = ____ cm

---

f)

Xiao Ming runs 400 m per lap and ran 5 laps.
How many kilometers did he run altogether?

5 × 400 = ____ m

____ m = ____ km

27. Area Axioms

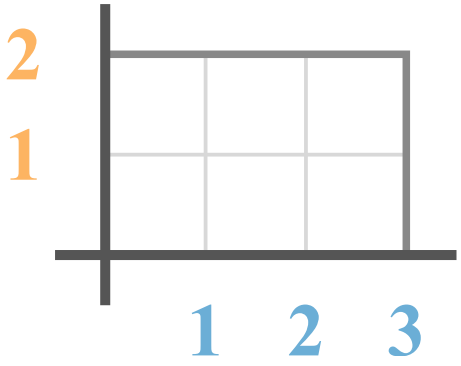
1. The area of any shape ≥ 0
2. Two shapes that completely overlap have **equal area**
3. Shapes placed together without overlapping: **total area = sum of parts**
4. A square with side length 1 has area 1

These four are the foundation — all area formulas derive from them

Unit square — area reference

27. Area Formula Derivation

Rectangle with length 3 and width 2



Divided into 3 × 2 = **6** unit squares

Each unit square has area = **1**

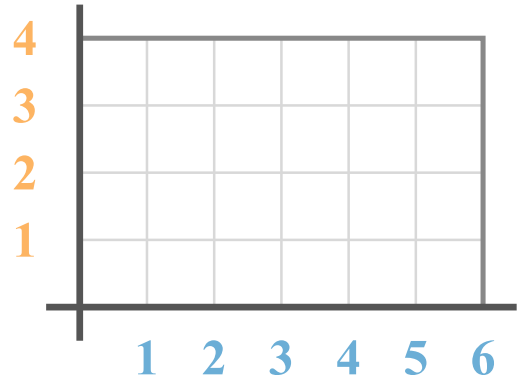
$$\text{Area} = 3 \times 2 = 6$$

Rectangle Area = length × width ← *derived theorem*

27. Area and Perimeter

a)

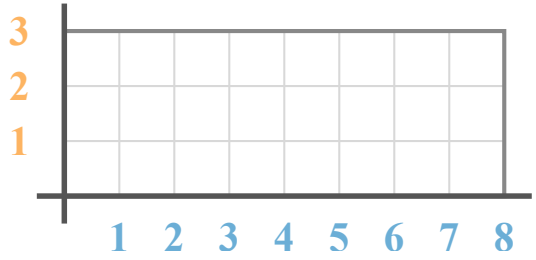
Perimeter = 2 × (**length + width**) | Area = **length × width**



Perimeter = 2 × (6 + 4) = 2 × 10 = 20 cm

Area = 6 × 4 = 24 cm²

b)

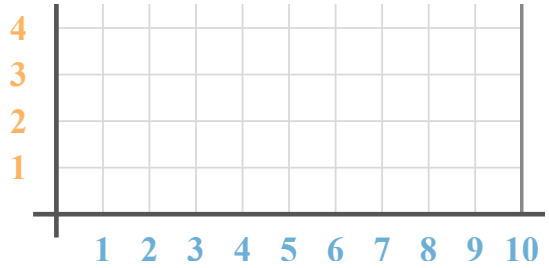


Perimeter = 2 × (+) = cm

Area = × = cm²

27. Area and Perimeter

c)

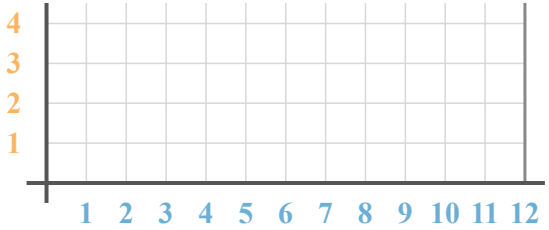


Perimeter = 2 × (+) = cm

Area = × = cm²

---

d)

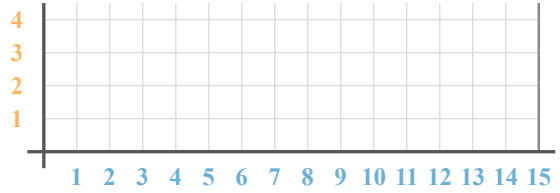


Perimeter = 2 × (+) = cm

Area = × = cm²

27. Area and Perimeter

e)



Perimeter = 2 × (+) = cm

Area = × = cm²

f)

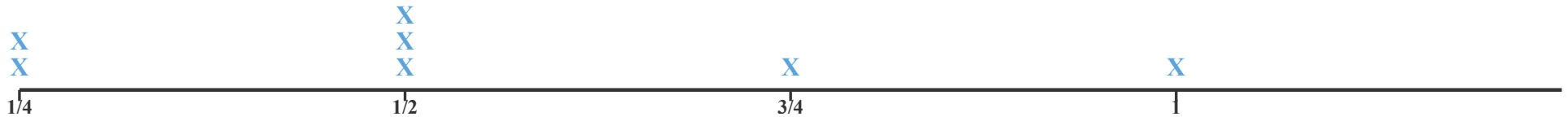
A rectangular garden is 9 m long and 6 m wide.
How much fencing is needed? What is the area?

Perimeter = 2 × (+) = m

Area = × = m²

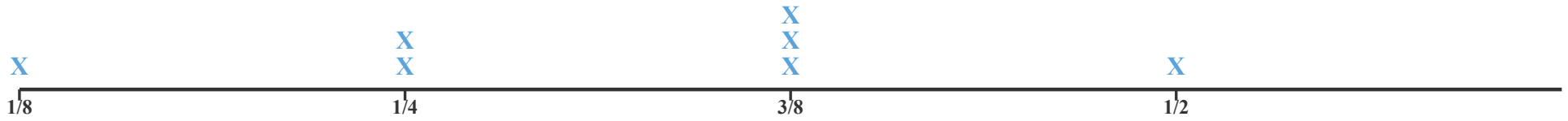
28. Fraction Line Plots

a)



Most: 1/2 (3), Least: 3/4 and 1 (1 each)

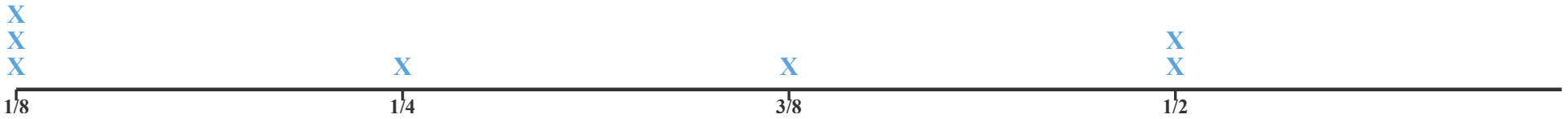
b)



Most: ( ), Least: ( )

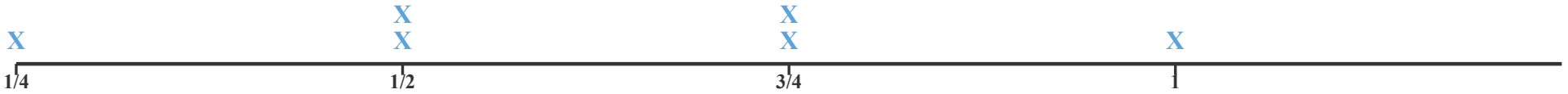
28. Fraction Line Plots

c)



Most: ( ), Least: ( )

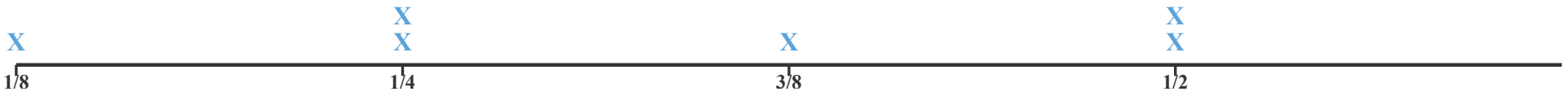
d)



Most: ( ), Least: ( )

28. Fraction Line Plots

e)



Most: ( ), Least: ( )

f)

Xiao Ming measured 8 pencils (in inches):

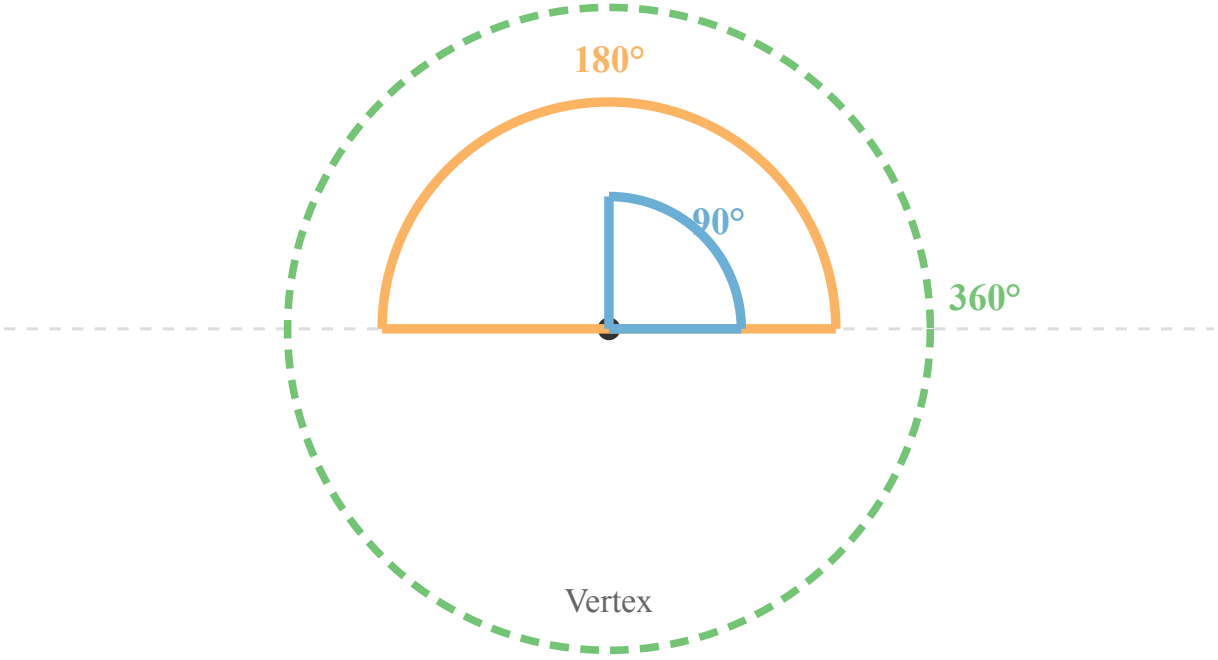
1/2, 3/4, 1/2, 1, 3/4, 1/2, 1/4, 3/4

Which length is most common? Which is least?

Most: , Least:

29. Introduction to Angles

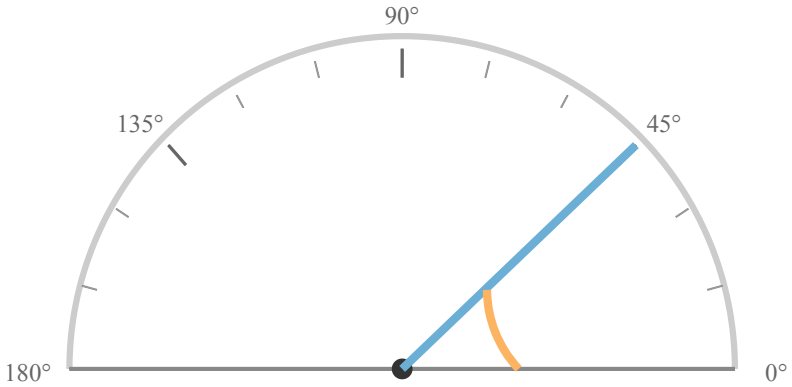
a)



Right angle = 90° Straight angle = 180° Full angle = 360°

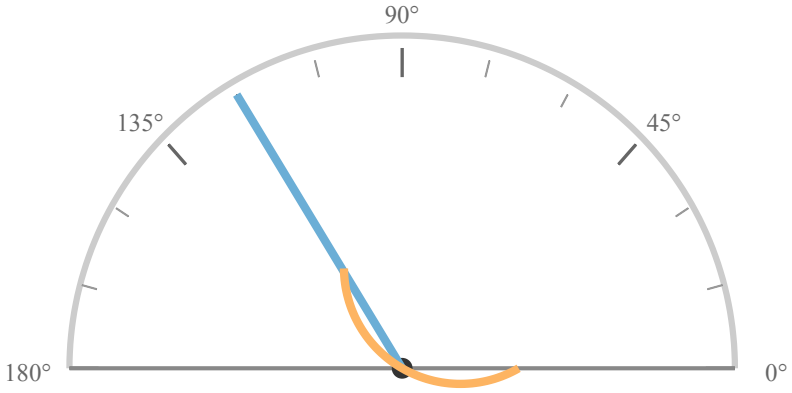
b)

Use the protractor to read the following angles:



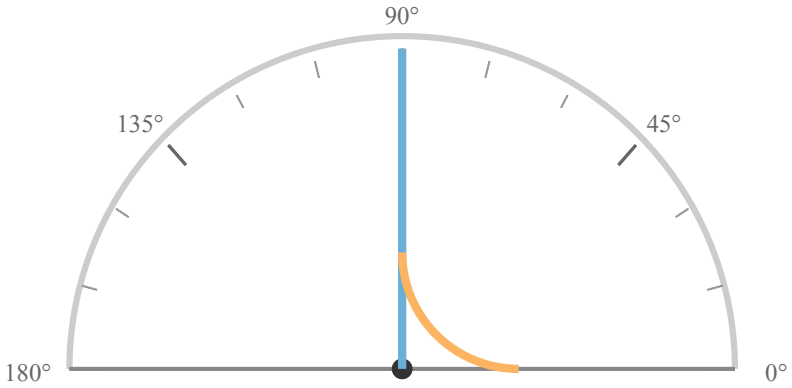
This angle = ____ **°**

c)



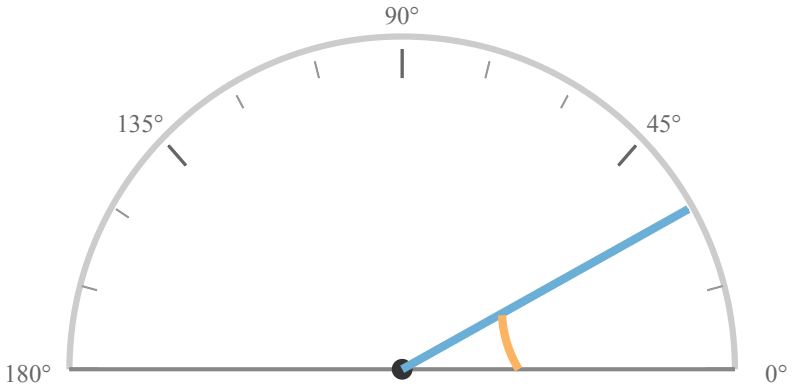
This angle = ____ **°**

d)



This angle = ____ °

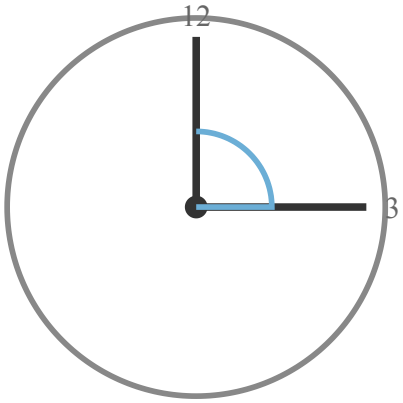
e)



This angle = ____ °

f)

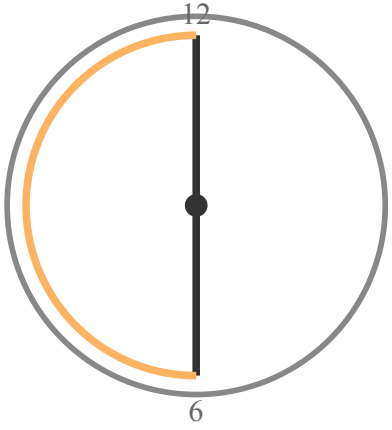
On a clock, how many degrees does the minute hand move from 12 to 3?



Angle = ____ °

g)

The minute hand moves from 6 to 12. How many degrees does it turn?

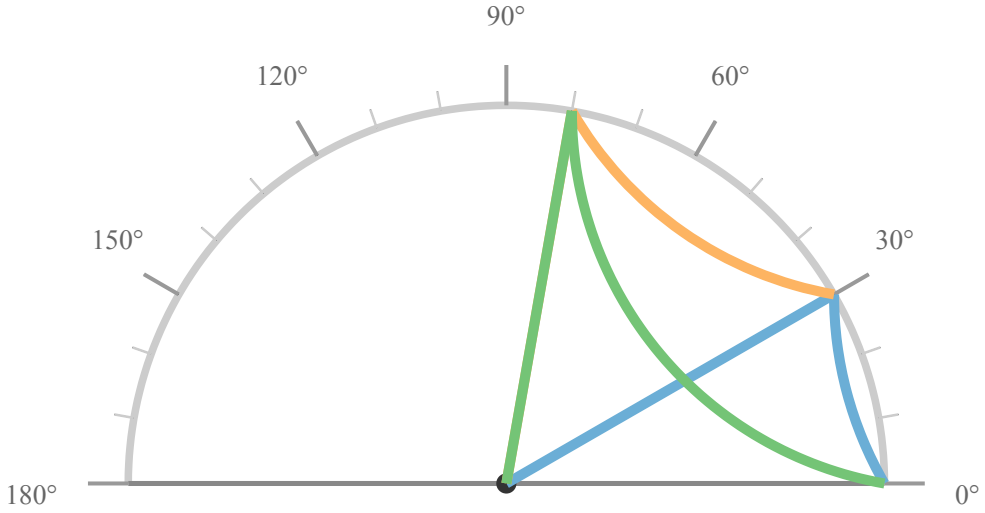


Angle = ____ °

30. Addition and Subtraction of Angles

a)

Use the protractor to see: 30° + 50° = ?

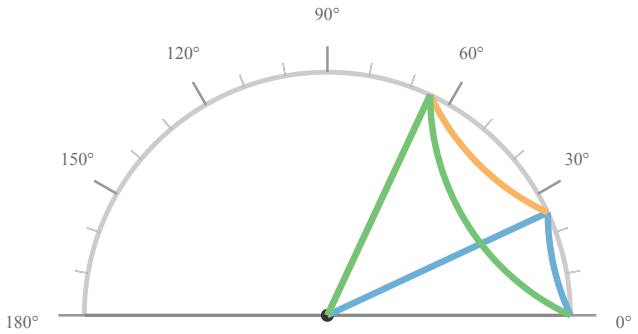


30° + 50° = 80°

80° - 30° = 50°

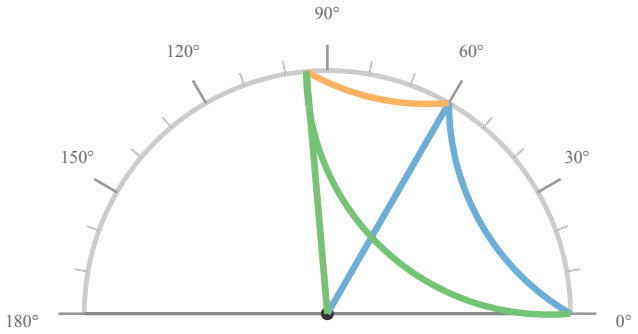
30. Addition and Subtraction of Angles

b)



25° + 40° = ____°

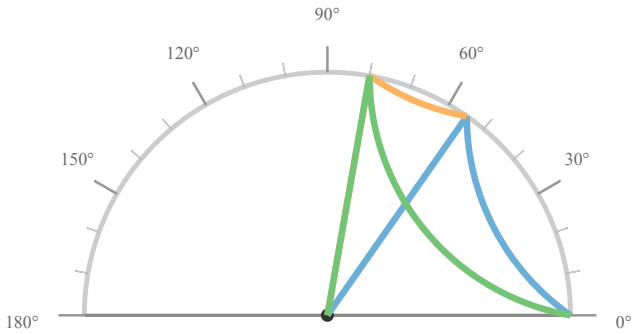
c)



60° + 35° = ____°

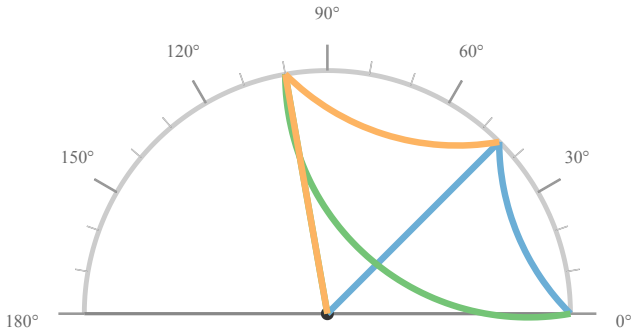
30. Addition and Subtraction of Angles

d)



55° + 25° = ____°

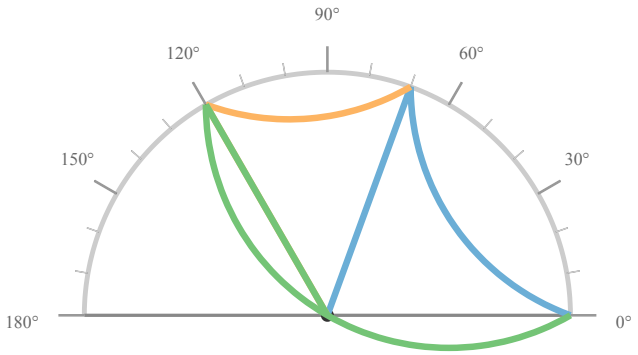
e)



100° - 45° = ____°

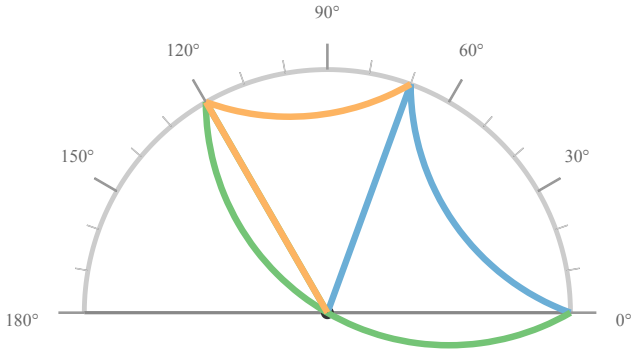
30. Addition and Subtraction of Angles

f)



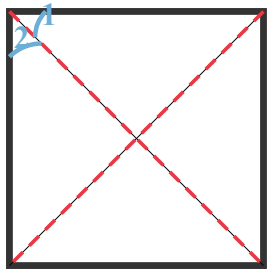
70° + 50° = ____ °

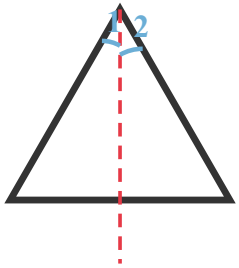
g)



120° - 70° = ____ °

a)

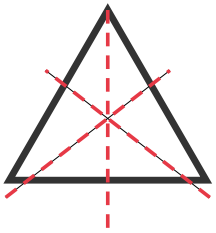




Angle 1 = Angle 2

b)

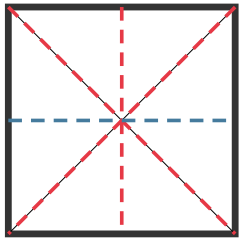
Three equal sides, three equal angles



Sides ____ Vertices ____ Symmetry axes ____ Through vertex ____ Not through vertex ____

c)

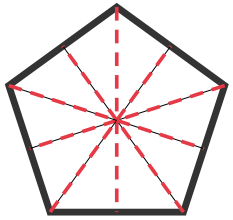
Four equal sides, four equal angles



Sides ____ Vertices ____ Symmetry axes ____ Through vertex ____ Not through vertex ____

d)

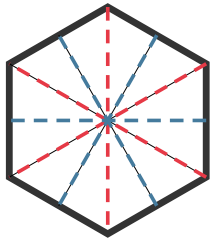
Five equal sides, five equal angles



Sides ____ Vertices ____ Symmetry axes ____ Through vertex ____ Not through vertex ____

e)

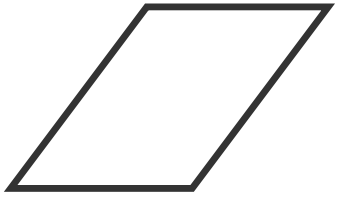
Six equal sides, six equal angles



Sides ____ Vertices ____ Symmetry axes ____ Through vertex ____ Not through vertex ____

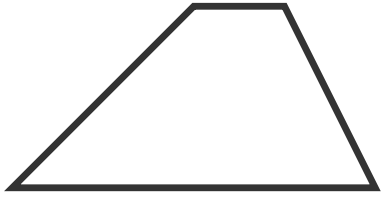
f)

Four equal sides, four unequal angles



Sides ____ Vertices ____ Symmetry axes ____ Through vertex ____ Not through vertex ____

Four unequal sides, four unequal angles



Sides ____ Vertices ____ Symmetry axes ____ Through vertex ____ Not through vertex ____