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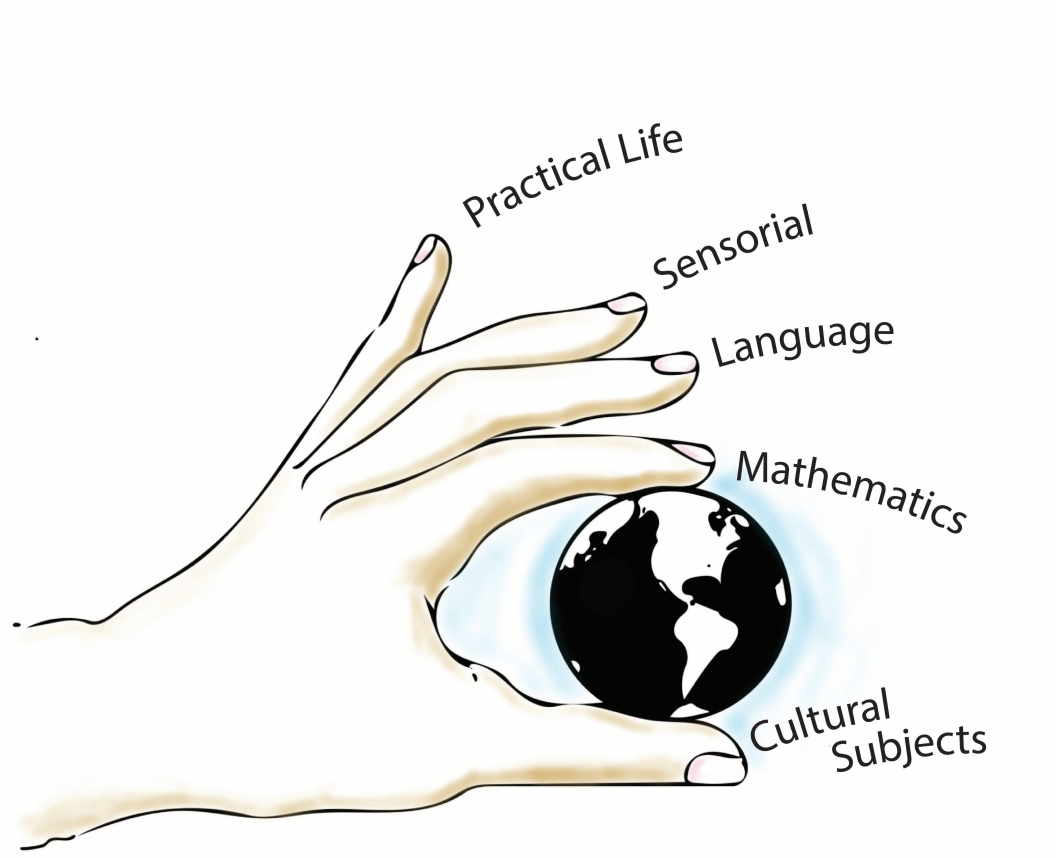

Mathematics

Early Childhood

Lesson Preparation Materials

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MEI, Inc Mathematics Early Childhood

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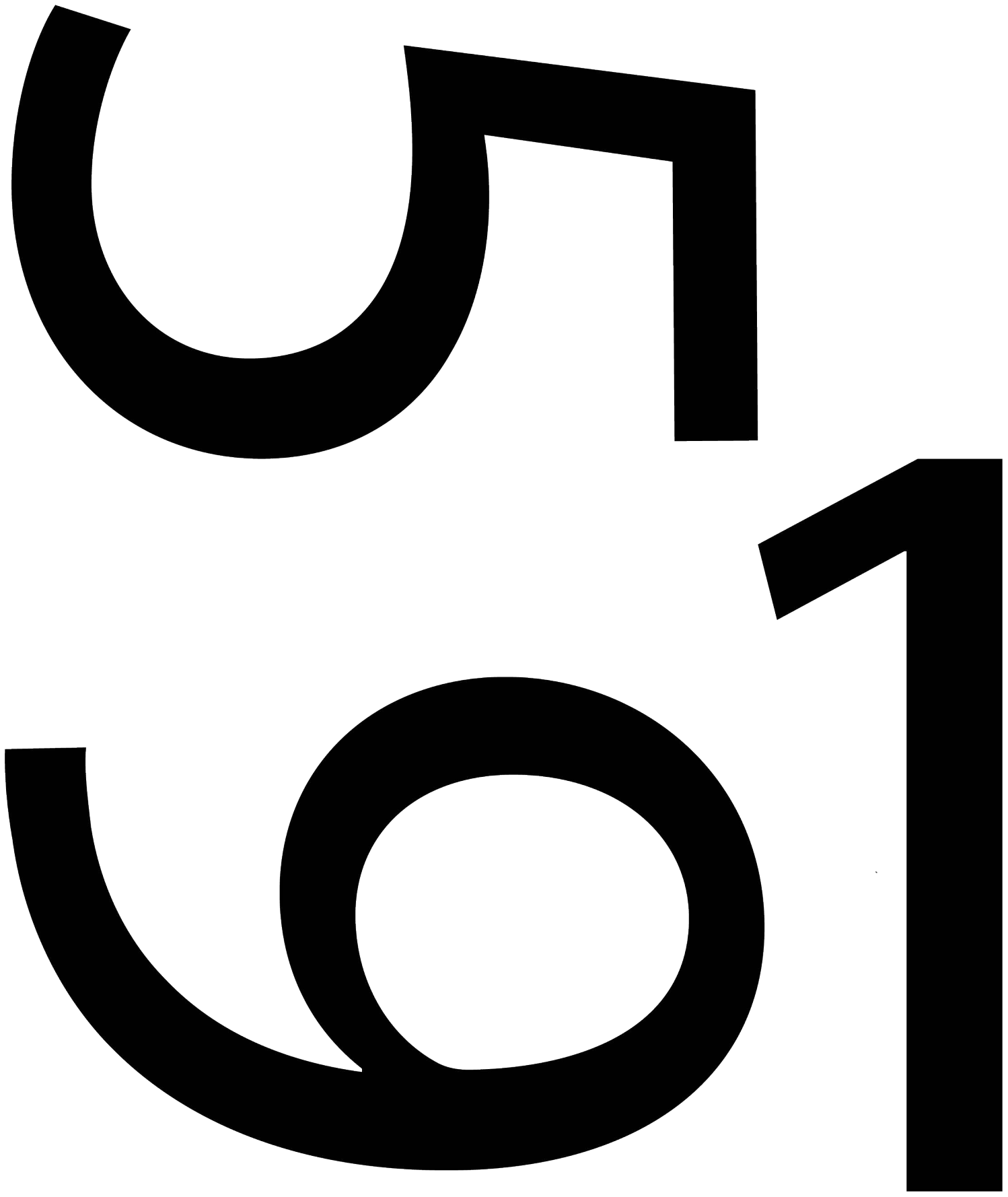

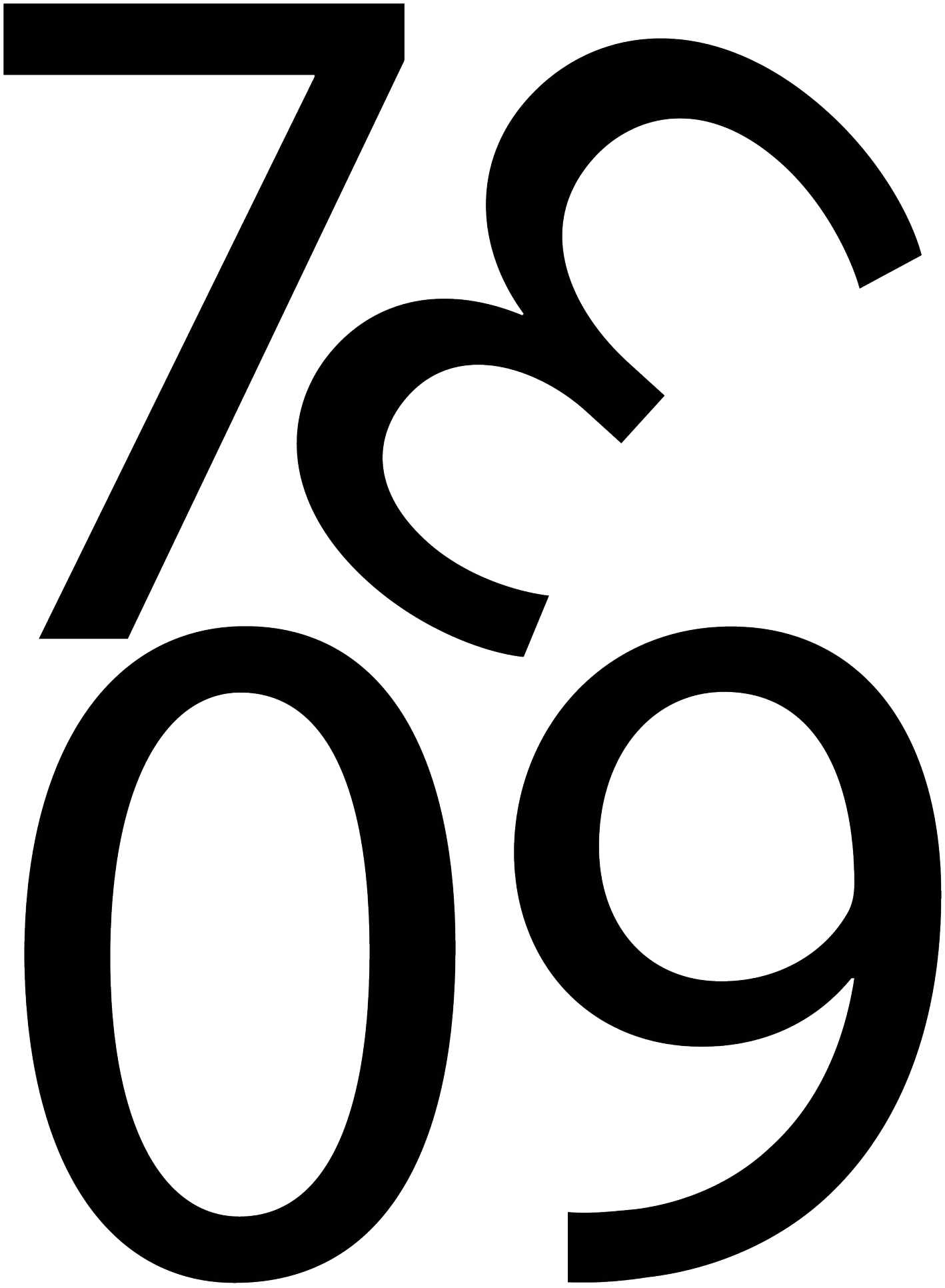

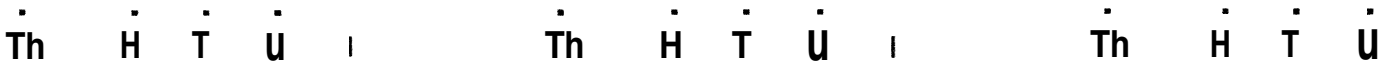

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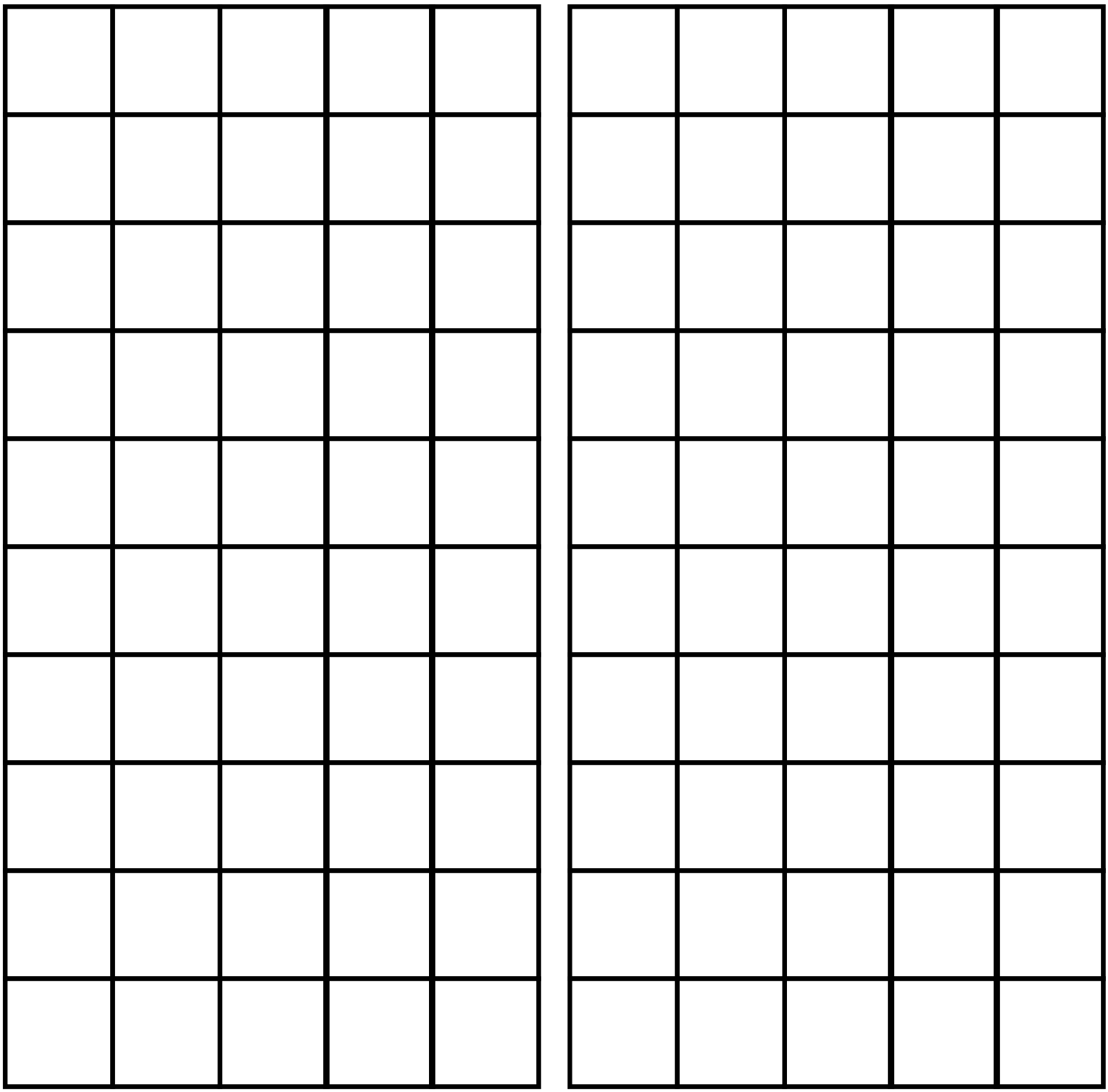

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1 + 6 =	3 + 6 =	5 + 6 =
1 + 7 =	3 + 7 =	5 + 7 =
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1 + 9 =	3 + 9 =	5 + 9 =

2 + 1 =	4 + 1 =	6 + 1 =
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7 + 1 =	**9 + 1 =**
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1 x 7 =	2 x 7 =	4 x 7 =
1 x 8 =	2 x 8 =	4 x 8 =
1 x 9 =	2 x 9 =	4 x 9 =
1 x 10 =	2 x 10 =	4 x 10 =

3 x 1 =	5 x 1 =
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3 x 3 =	5 x 3 =
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6 x 6 =	8 x 6 =	10 x 6 =
6 x 7 =	8 x 7 =	10 x 7 =
6 x 8 =	8 x 8 =	10 x 8 =
6 x 9 =	8 x 9 =	10 x 9 =
6 x 10 =	8 x 10 =	10 x 10 =

7 x 1 =	9 x 1 =
7 x 2 =	9 x 2 =
7 x 3 =	9 x 3 =
7 x 4 =	9 x 4 =
7 x 5 =	9 x 5 =
7 x 6 =	9 x 6 =
7 x 7 =	9 x 7 =
7 x 8 =	9 x 8 =
7 x 9 =	9 x 9 =
7 x 10 =	9 x 9

81 ÷ 9 =

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56 ÷ 8 =

56 ÷ 7 =

56 ÷ 6 =

72 ÷ 9 =

72 ÷ 8 =

63 ÷ 9 =

63 ÷ 8 =

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54 ÷ 9 =

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54 ÷ 7 =

54 ÷ 6 =

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49 ÷ 8 =	**45 ÷ 8 =**	**40 ÷ 8 =**
49 ÷ 7 =	**45 ÷ 7 =**	**40 ÷ 7 =**
49 ÷ 6 =	**45 ÷ 6 =**	**40 ÷ 6 =**
49 ÷ 5 =	**45 ÷ 5 =**	**40 ÷ 5 =**

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48 ÷ 8 =	**42 ÷ 8 =**	**36 ÷ 8 =**
48 ÷ 7 =	**42 ÷ 7 =**	**36 ÷ 7 =**
48 ÷ 6 =	**42 ÷ 6 =**	**36 ÷ 6 =**
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24 ÷ 8 =	20 ÷ 8 =	16 ÷ 8 =
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24 ÷ 5 =	20 ÷ 5 =	16 ÷ 5 =
24 ÷ 4 =	20 ÷ 4 =	16 ÷ 4 =
24 ÷ 3 =	20 ÷ 3 =	16 ÷ 3 =
		16 ÷ 2 =

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21 ÷ 5 =	18 ÷ 5 =	15 ÷ 5 =
21 ÷ 4 =	18 ÷ 4 =	15 ÷ 4 =
21 ÷ 3 =	18 ÷ 3 =	15 ÷ 3 =
	18 ÷ 2 =	15 ÷ 2 =

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14 ÷ 7 =	10 ÷ 7 =	8 ÷ 6 =
14 ÷ 6 =	10 ÷ 6 =	8 ÷ 5 =
14 ÷ 5 =	10 ÷ 5 =	8 ÷ 4 =
14 ÷ 4 =	10 ÷ 4 =	8 ÷ 3 =
14 ÷ 3 =	10 ÷ 3 =	8 ÷ 2 =
14 ÷ 2 =	10 ÷ 2 =	8 ÷ 1 =

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12 ÷ 8 =	9 ÷ 8 =	7 ÷ 6 =
12 ÷ 7 =	9 ÷ 7 =	7 ÷ 5 =
12 ÷ 6 =	9 ÷ 6 =	7 ÷ 4 =
12 ÷ 5 =	9 ÷ 5 =	7 ÷ 3 =
12 ÷ 4 =	9 ÷ 4 =	7 ÷ 2 =
12 ÷ 3 =	9 ÷ 3 =	7 ÷ 1 =
12 ÷ 2 =	9 ÷ 2 =	
	9 ÷ 1 =	

6 ÷ 6 =	4 ÷ 4 =	2 ÷ 2 =
6 ÷ 5 =	4 ÷ 3 =	2 ÷ 1 =
6 ÷ 4 =	4 ÷ 2 =	
6 ÷ 3 =	4 ÷ 1 =	
6 ÷ 2 =		
6 ÷ 1 =		

5 ÷ 5 =	3 ÷ 3 =	1 ÷ 1 =
5 ÷ 4 =	3 ÷ 2 =	
5 ÷ 3 =	3 ÷ 1 =	
5 ÷ 2 =		
5 ÷ 1 =		

9	7 r. 1	6 r. 2
	8	7
	9 r. 1	8
		9 r. 2

8	7	6
9	7 r. 7	6 r. 6
	9	7 r. 5
		9

5 r. 4	5	4 r. 4
6 r. 1	5 r. 5	5
7	6 r. 3	5 r. 5
8 r. 1	7 r. 3	6 r. 4
9 r. 4	9	8

5 r. 3	4 r. 6	4
6	5 r. 2	4 r. 4
6 r. 6	6	5 r. 1
8	7	6
9 r. 3	8 r. 2	7 r. 1
		9

3 r. 8	3 r. 3	3
4 r. 3	3 r. 6	3 r. 3
5	4 r. 2	3 r. 6
5 r. 5	5	4 r. 3
7	6	5 r. 2
8 r. 3	7 r. 2	6 r. 3
		9

3 r. 5	3 r. 1	2 r. 7
4	3 r. 4	3 r. 1
4 r. 4	4	3 r. 4
5 r. 2	4 r. 4	4 r. 1
6 r. 2	5 r. 3	5
8	7	6 r. 1
	9 r. 1	8 r. 1

2 r. 6	2 r. 2	1 r. 7
3	2 r. 4	2
3 r. 3	2 r. 6	2 r. 2
4	3 r. 2	2 r. 4
4 r. 4	4	3 r. 1
6	5	4
8	6 r. 2	5 r. 1
		8

2 r. 3	2	1 r. 6
2 r. 5	2 r. 2	1 r. 7
3	2 r. 4	2 r. 1
3 r. 3	3	2 r. 3
4 r. 1	3 r. 3	3
5 r. 1	4 r. 2	3 r. 3
7	6	5
	9	7 r. 1

1 r. 5	1 r. 1	1
1 r. 6	1 r. 2	1 r. 1
2	1 r. 3	1 r. 2
2 r. 2	1 r. 4	1 r. 3
2 r. 4	2	2
3 r. 2	2 r. 2	2 r. 2
4 r. 2	3 r. 1	4
7	5	8

1 r. 3	1	1
1 r. 4	1 r. 1	1 r. 1
1 r. 5	1 r. 2	1 r. 2
2	1 r. 3	1 r. 3
2 r. 2	1 r. 4	2 r. 1
3	1 r. 5	3 r. 1
4	3	7
6	4 r. 1	
	9	

1	1	1
1 r. 1	1 r. 1	2
1 r. 2	2	
2	4	
3		
6		

1	1	1
1 r. 1	1 r. 1	
1 r. 2	3	
2 r. 1		
5		

Factors of ___ are:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Multiples of __ are:

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

The greatest common factor

or G.C.F.

of

_____ and _____

IS

_____

The least common multiple

or L.C.M.

of

_____ and _____

IS

_____

Name _____ Date _____

MULTIPLES

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Name _____

Date _____

ADDITION

0	1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9	10
2	3	4	5	6	7	8	9	10	11
3	4	5	6	7	8	9	10	11	12
4	5	6	7	8	9	10	11	12	13
5	6	7	8	9	10	11	12	13	14
6	7	8	9	10	11	12	13	14	15
7	8	9	10	11	12	13	14	15	16
8	9	10	11	12	13	14	15	16	17
9	10	11	12	13	14	15	16	17	18

ADDITION

0	1	2	3	4	5	6	7	8	9
1	2	3	4	5	6	7	8	9	10
2	3	4	5	6	7	8	9	10	11
3	4	5	6	7	8	9	10	11	12
4	5	6	7	8	9	10	11	12	13
5	6	7	8	9	10	11	12	13	14
6	7	8	9	10	11	12	13	14	15
7	8	9	10	11	12	13	14	15	16
8	9	10	11	12	13	14	15	16	17
9	10	11	12	13	14	15	16	17	18

Name _____

Date _____

MULTIPLICATION

1	2	3	4	5	6	7	8	9	10
2									
3									
4									
5									
6									
7									
8									
9									
10									

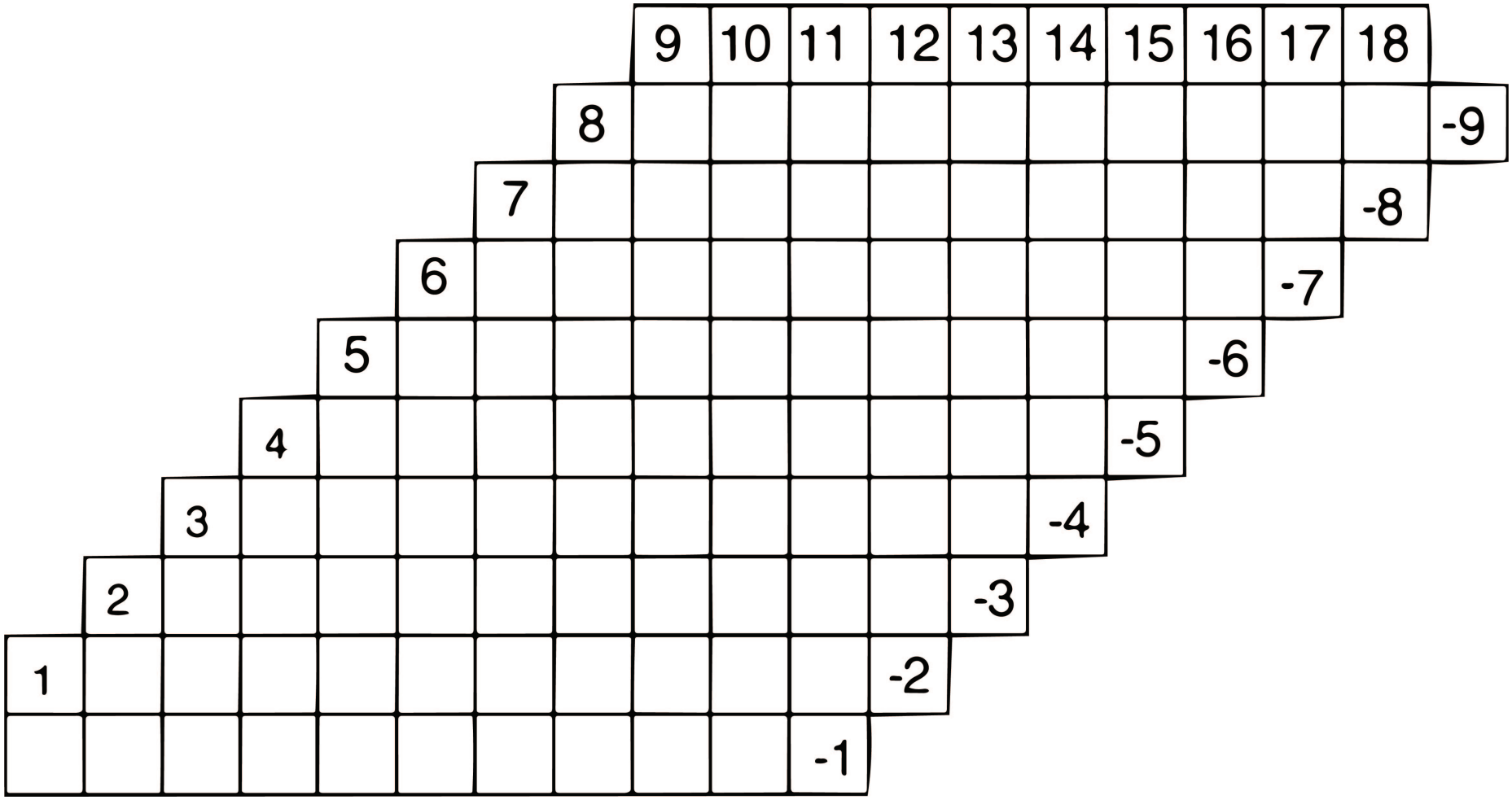
MULTIPLICATION

1	2	3	4	5	6	7	8	9	10
2	4	6	8	10	12	14	16	18	20
3	6	9	12	15	18	21	24	27	30
4	8	12	16	20	24	28	32	36	40
5	10	15	20	25	30	35	40	45	50
6	12	18	24	30	36	42	48	54	60
7	14	21	28	35	42	49	56	65	70
8	16	24	32	40	48	56	64	72	80
9	18	27	36	45	54	65	72	81	90
10	20	30	40	50	60	70	80	90	100

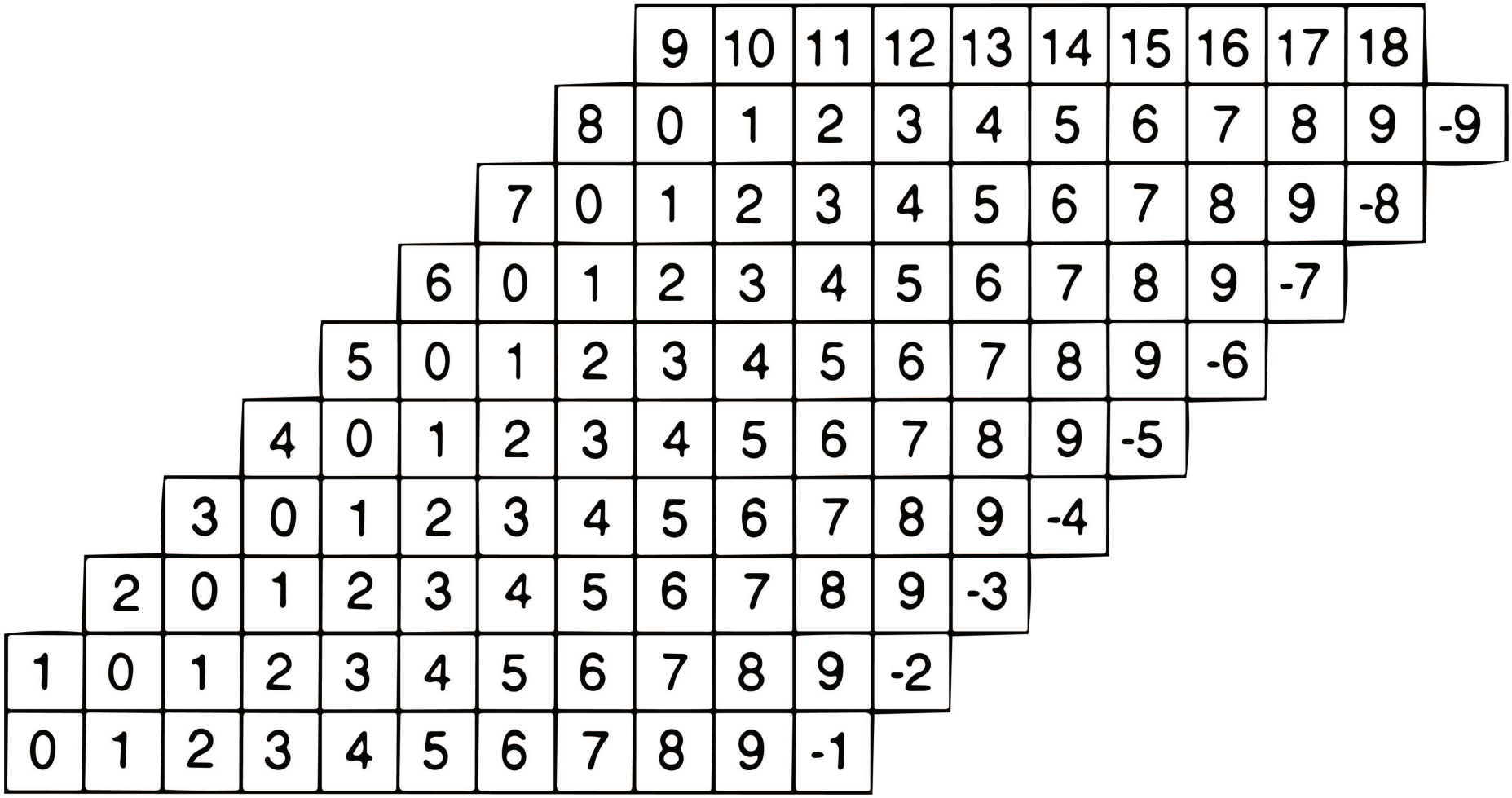
Name _____

Date _____

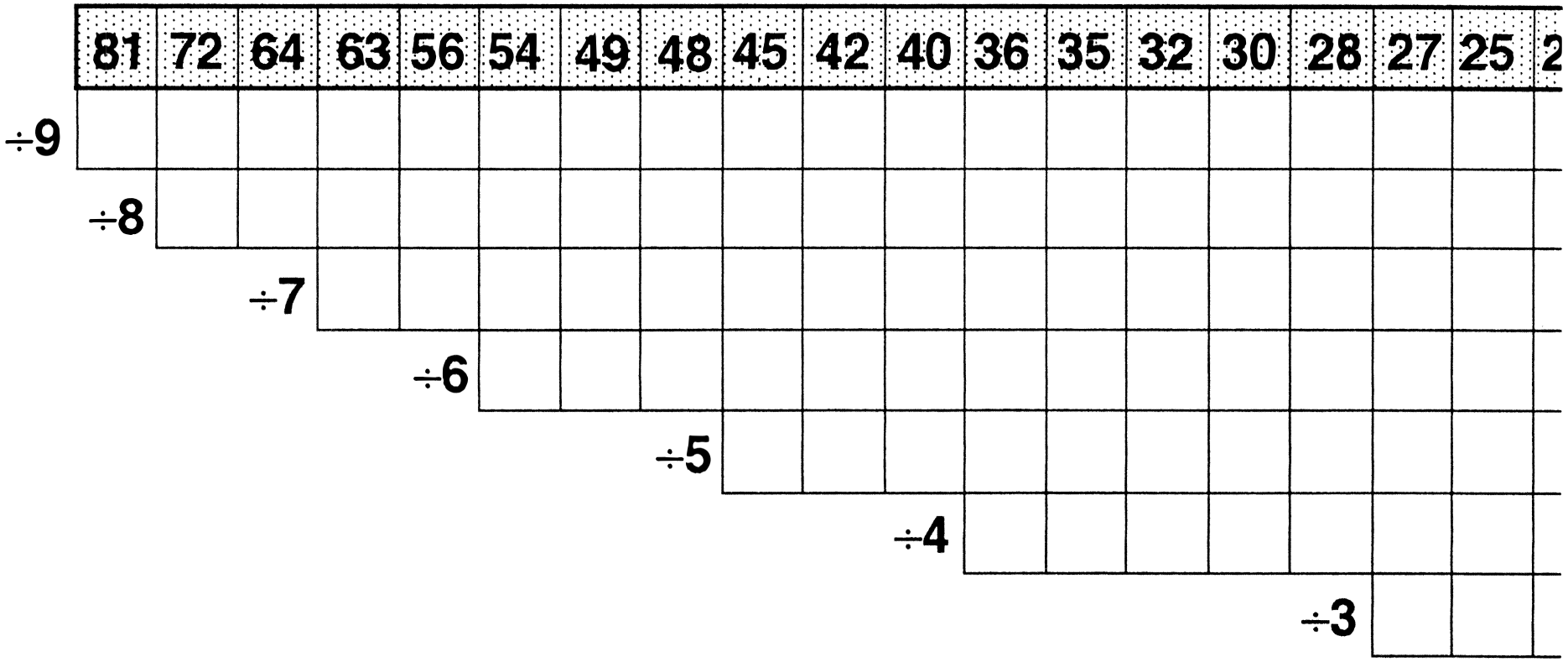
SUBTRACTION



SUBTRACTION

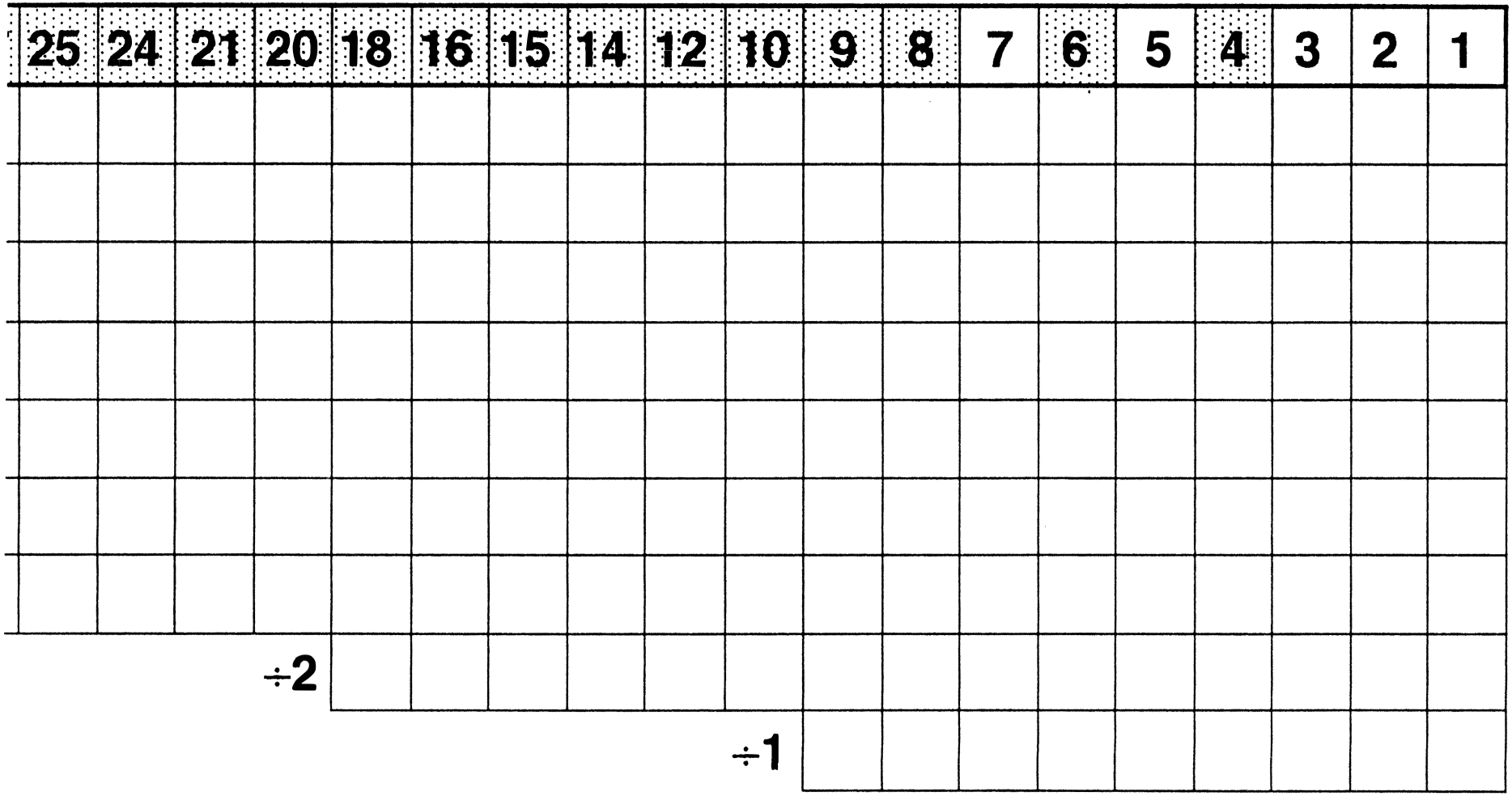


DIVISION



Name _____

Date _____



DIVISION

	81	72	64	63	56	54	49	48	45	42	40	36	35	32	30	28	27	25
÷9	9	8		7		6			5			4					3	
÷8	9	8		7			6			5			4					
÷7	9	8			7			6			5			4				
÷6	9		8		7		6		5			4			3			
÷5	9		8		7		6		5			4			3			2
÷4	9		8		7		6		5			4			3			2
÷3	9		8		7		6		5			4			3			2

7	25	24	21	20	18	16	15	14	12	10	9	8	7	6	5	4	3	2	1
					2						1								
		3				2						1							
			3					2					1						
		4			3				2					1					
	5			4			3			2					1				
		6		5		4			3			2				1			
		8	7		6		5		4		3			2			1		
				÷2	9	8		7	6	5		4		3		2		1	
										÷1	9	8	7	6	5	4	3	2	1

$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{2}{2}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{3}$
$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{1}{3}$	$\frac{2}{3}$	$\frac{3}{3}$
$\frac{1}{4}$	$\frac{2}{4}$	$\frac{3}{4}$	$\frac{4}{4}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$
$\frac{1}{5}$	$\frac{1}{5}$	$\frac{1}{5}$	$\frac{2}{5}$	$\frac{3}{5}$	$\frac{4}{5}$	$\frac{5}{5}$
$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$	$\frac{1}{6}$
$\frac{2}{6}$	$\frac{3}{6}$	$\frac{4}{6}$	$\frac{5}{6}$	$\frac{6}{6}$	$\frac{1}{7}$	$\frac{1}{7}$

$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{2}{7}$
$\frac{3}{7}$	$\frac{4}{7}$	$\frac{5}{7}$	$\frac{6}{7}$	$\frac{7}{7}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$
$\frac{2}{8}$	$\frac{3}{8}$	$\frac{4}{8}$	$\frac{5}{8}$	$\frac{6}{8}$	$\frac{7}{8}$	$\frac{8}{8}$
$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$
$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{2}{9}$	$\frac{3}{9}$	$\frac{4}{9}$	$\frac{5}{9}$

$\frac{6}{9}$ $\frac{7}{9}$ $\frac{8}{9}$ $\frac{9}{9}$

$\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$

$\frac{1}{10}$ $\frac{1}{10}$ $\frac{1}{10}$

$\frac{1}{10}$ $\frac{2}{10}$ $\frac{3}{10}$ $\frac{4}{10}$ $\frac{5}{10}$ $\frac{6}{10}$ $\frac{7}{10}$

$\frac{8}{10}$ $\frac{9}{10}$ $\frac{10}{10}$

Multiplying the numerator and denominator by the same whole number does not change the value of the fraction.

Example:

$$\frac{1}{2} \times \frac{4}{4} = \frac{4}{8}$$

Dividing the numerator and denominator by the same whole number does not change the value of the fraction.

Example:

$$\frac{4}{8} \div \frac{2}{2} = \frac{2}{4}$$

Dividing the numerator and denominator by their highest common factor will reduce the fraction to its lowest form.

Example:

$$\frac{4}{8} \div \frac{4}{4} = \frac{1}{2}$$

In addition of fractions with like denominators, add the numerators only and reduce to the lowest form.

Example:

$$\frac{2}{6} + \frac{2}{6} = \frac{4}{6} = \frac{2}{3}$$

In subtraction of fractions with like denominators, subtract the numerators only and reduce to the lowest form.

Example:

$$\frac{7}{8} - \frac{3}{8} = \frac{4}{8} = \frac{1}{2}$$

In multiplication of fractions by whole numbers, multiply the numerators only and reduce to the lowest form.

Example:

$$\frac{1}{6} - 3 \quad \frac{1 \times 3}{6} = \frac{3}{6} = \frac{1}{2}$$

If the denominator is divisible by the whole number, such division will give the answer without the need to reduce it to the lowest form.

Example:

$$\frac{1}{6} \times 3 = \frac{1}{6 \div 3} = \frac{1}{2}$$

In division of fractions by whole numbers, divide the numerator by the whole number if possible. Otherwise, multiply the denominator by the whole number.

Example:

$$\frac{2}{3} \div 2 = \frac{2 \div 2}{3} = \frac{1}{3}$$

$$\frac{1}{2} \div 2 = \frac{1}{2 \times 2} = \frac{1}{4}$$

FRACTION PROBLEMS

1/2 + 1/2 =

1/3 + 1/3 =

1/4 + 2/4 =

2/5 + 3/5 =

1/6 + 4/6 =

2/7 + 3/7 =

2/8 + 3/8 =

3/9 + 4/9 =

1/9 + 6/9 =

2/10 + 5/10 =

4/10 + 5/10 =

1/10 + 7/10 =

3/4 - 1/4 =

4/5 - 3/5 =

2/5 - 1/5 =

5/6 - 1/6 =

2/6 - 1/6 =	1/3 X 2 =
6/7 - 4/7 =	1/4 X 3 =
5/7 - 3/7 =	2/4 X 2 =
3/8 - 1/8 =	2/5 X 2 =
7/8 - 5/8 =	1/5 X 3 =
2/9 - 1/9 =	2/6 X 3 =
8/9 - 6/9 =	1/7 X 6 =
9/10 - 8/10 =	2/8 X 3 =
1/2 X 2 =	2/9 X 4 =

3/10 X 3 =

1/10 X 9 =

2/2 + 2 =

2/4 + 2 =

2/3 + 2 =

3/4 + 3 =

4/5 + 2 =

3/6 + 3 =

7/7 + 7 =

4/7 + 4 =

6/8 + 3 =

8/9 + 8 =

6/10 + 3 =

8/10 + 4 =

EQUIVALENT FRACTIONS

Find equivalent fractions for 1 /2.

Find equivalent fractions for 2/3.

Find equivalent fractions for 1/4.

Find equivalent fractions for 1/3.

Find equivalent fractions for 3/4.

Find equivalent fractions for 4/5.

REDUCTION OF FRACTIONS

Reduce 4/8 to the lowest form.

Reduce 3/6 to the lowest form.

Reduce 6/9 to the lowest form.

Reduce 5/10 to the lowest form.

Reduce 2/4 to the lowest form.

Reduce 4/6 to the lowest form.

Reduce 2/6 to the lowest form.

Reduce 8/10 to the lowest form.

Reduce 7/7 to the lowest form.

Reduce 2/8 to the lowest form.

Reduce 3/9 to the lowest form.

Reduce 2/10 to the lowest form.

Reduce 4/10 to the lowest form.

Reduce 6/10 to the lowest form.

first	1st
second	2nd
third	3rd
fourth	4th
fifth	5th
sixth	6th
seventh	7th
eighth	8th
ninth	9th
tenth	10th

COMMANDS FOR ORDINALS

Set 1

Place the red counter on the first section.

Place the pink counter on the third section.

Place the light blue counter on the fifth section.

Place the yellow counter on the fourth section.

Place the gold counter on the tenth section.

Place the lavender counter on the sixth section.

Place the green counter on the second section.

Place the brown counter on the eighth section.

Place the dark blue counter on the ninth section.

Set 2

Place a gold counter in the last position from the left.

Place a dark blue counter in the second position from the right.

Place a white counter in the seventh position from the left.

Place a light blue counter in the fifth position from the left.

Place a lavender counter in the fifth position from the right.

Place a red counter in the first position.

Place a yellow counter in the fourth position from the left.

Place a brown counter in the third position from the right.

Place two pink counters in the third position.

Place a green counter in the second position from the left.

Ordinal Commands for Bead Stringing

1
Hold the string so that the knot is at the left.
Place a blue bead first on the string.
Place a bead that is a cube second.
Place a yellow bead third.
Place a bead that is a sphere fourth. Place a green bead fifth.

2
Hold the string so that the knot is at the left.
Place a red bead first on the string.
Place a blue bead second.
Place a green bead third.
Place a yellow bead fourth.
Place a red bead fifth.
Place a blue bead sixth.
Place a green bead seventh.
Place a yellow bead eighth.

3
Hold the string so that the knot is at the left.
Place a bead that is a cube first.
Place a bead that is a sphere second.
Place a bead that is a cylinder third.
Place a bead that is an ellipsoid fourth.

4
Hold the string so that the knot is at the left.
Place a yellow bead first.
Place a green bead second that is a different shape.
Place a yellow bead third that is the same shape as the first bead. Place a green bead fourth that is the same shape as the second bead.

=	−
equals	minus
≠	X
not equal to	times
+	÷
plus	divided by

>

greater than

¢

cent

<

less than

$

dollar

18 ◯ 3=6

18 ◯ 9

2 ◯ 4=8

3 ◯ 7

8 ◯ 3=5

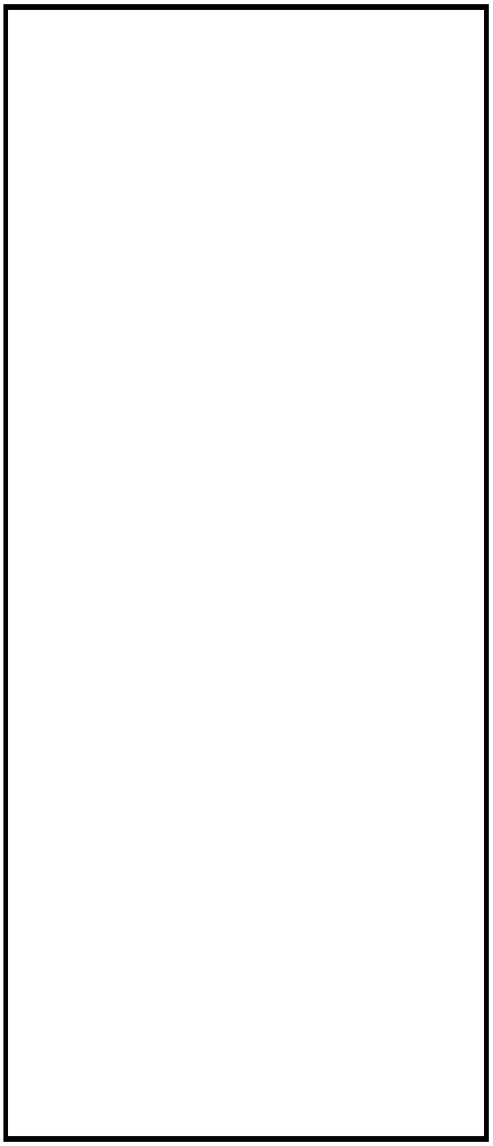
1+5 ◯ 5+1

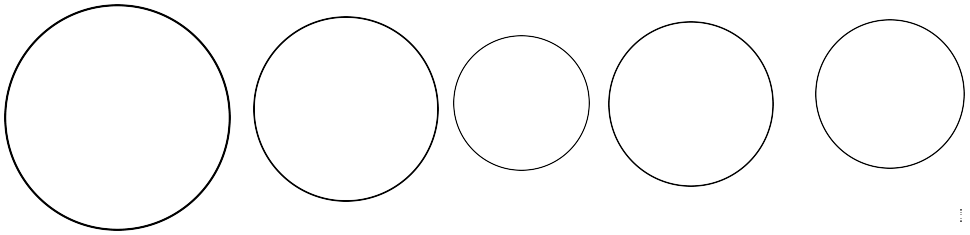
2 ◯ 7=9

3 ◯ 4

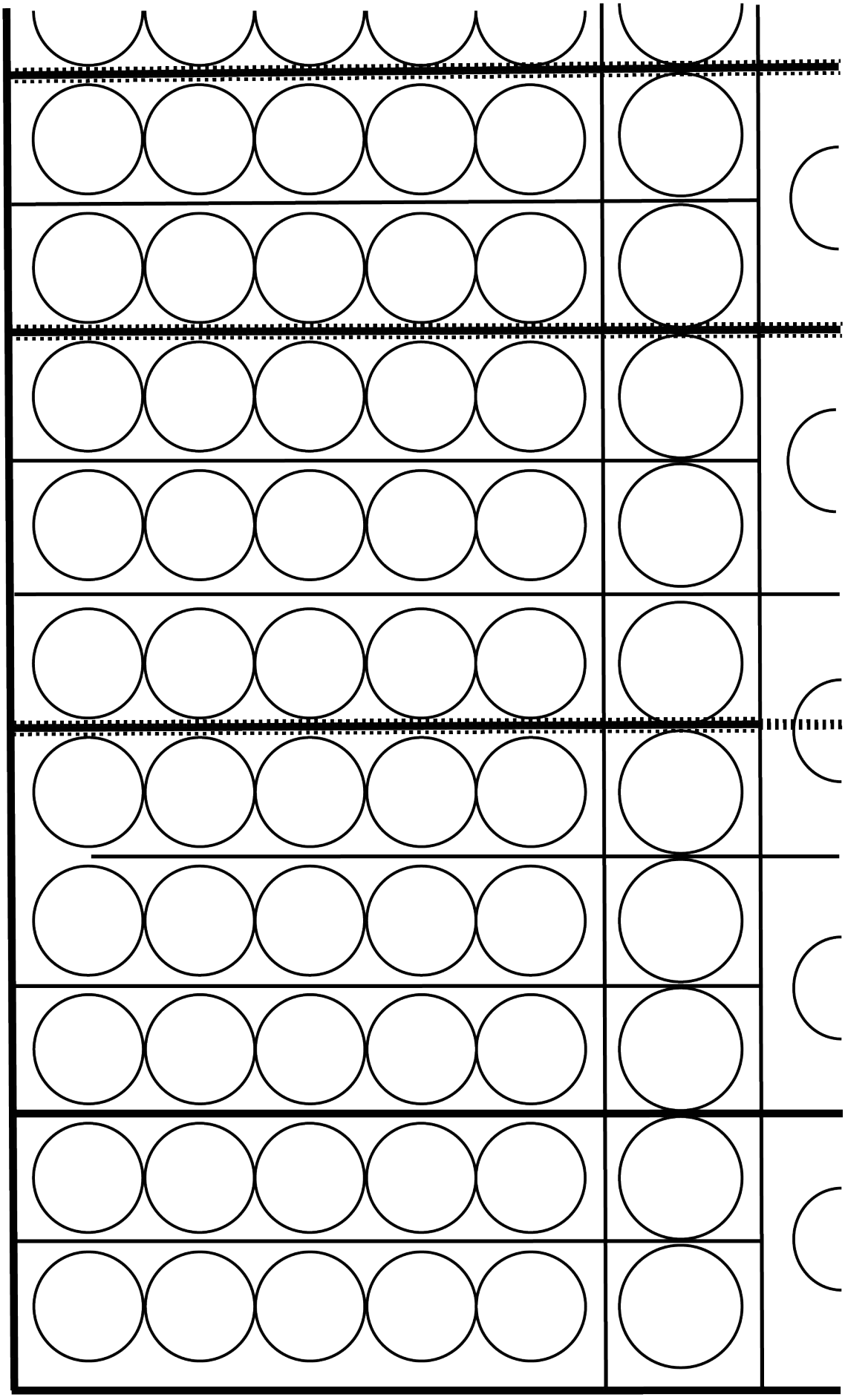
3+4 ◯ 7

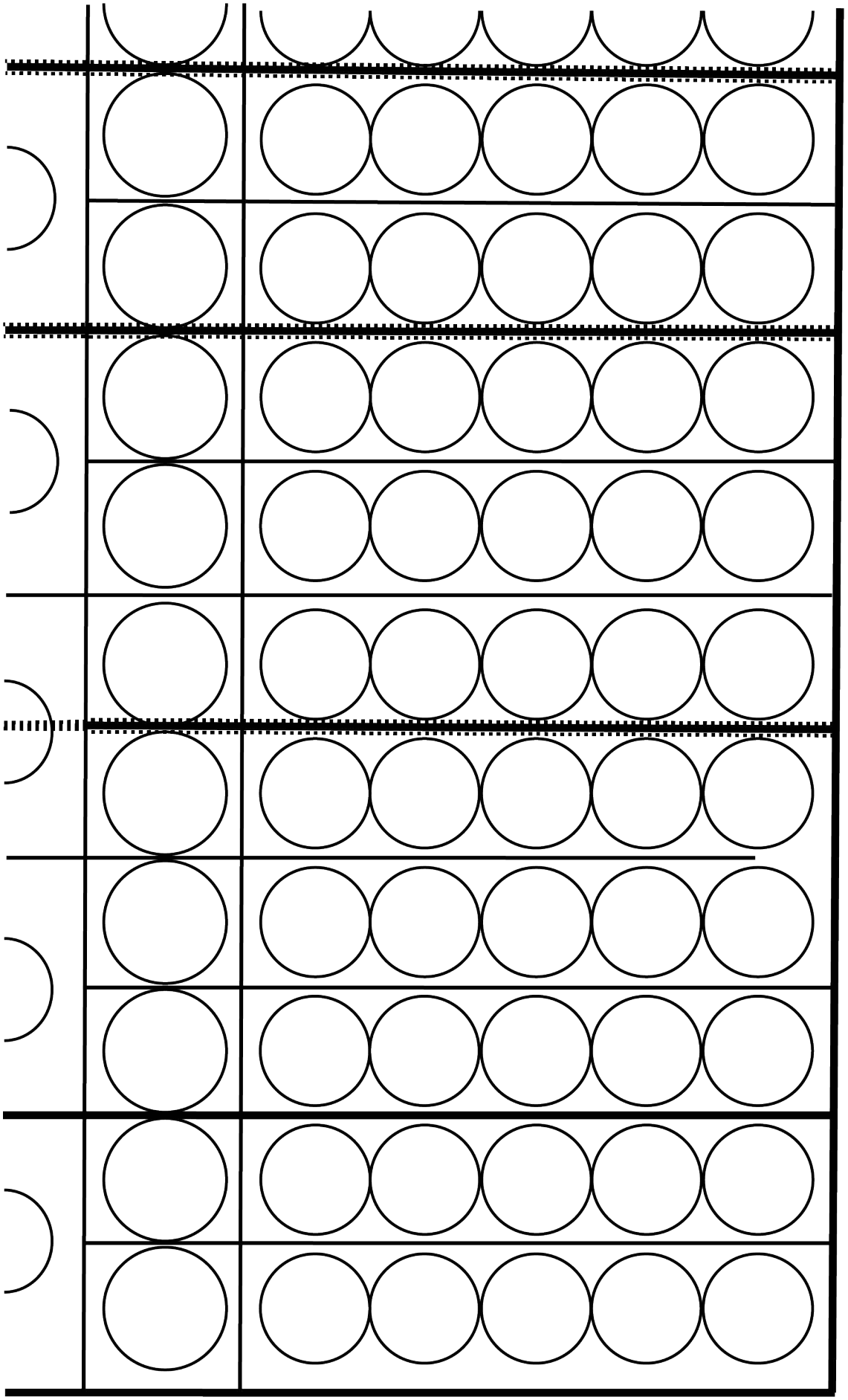
4+5 ◯ 6-1

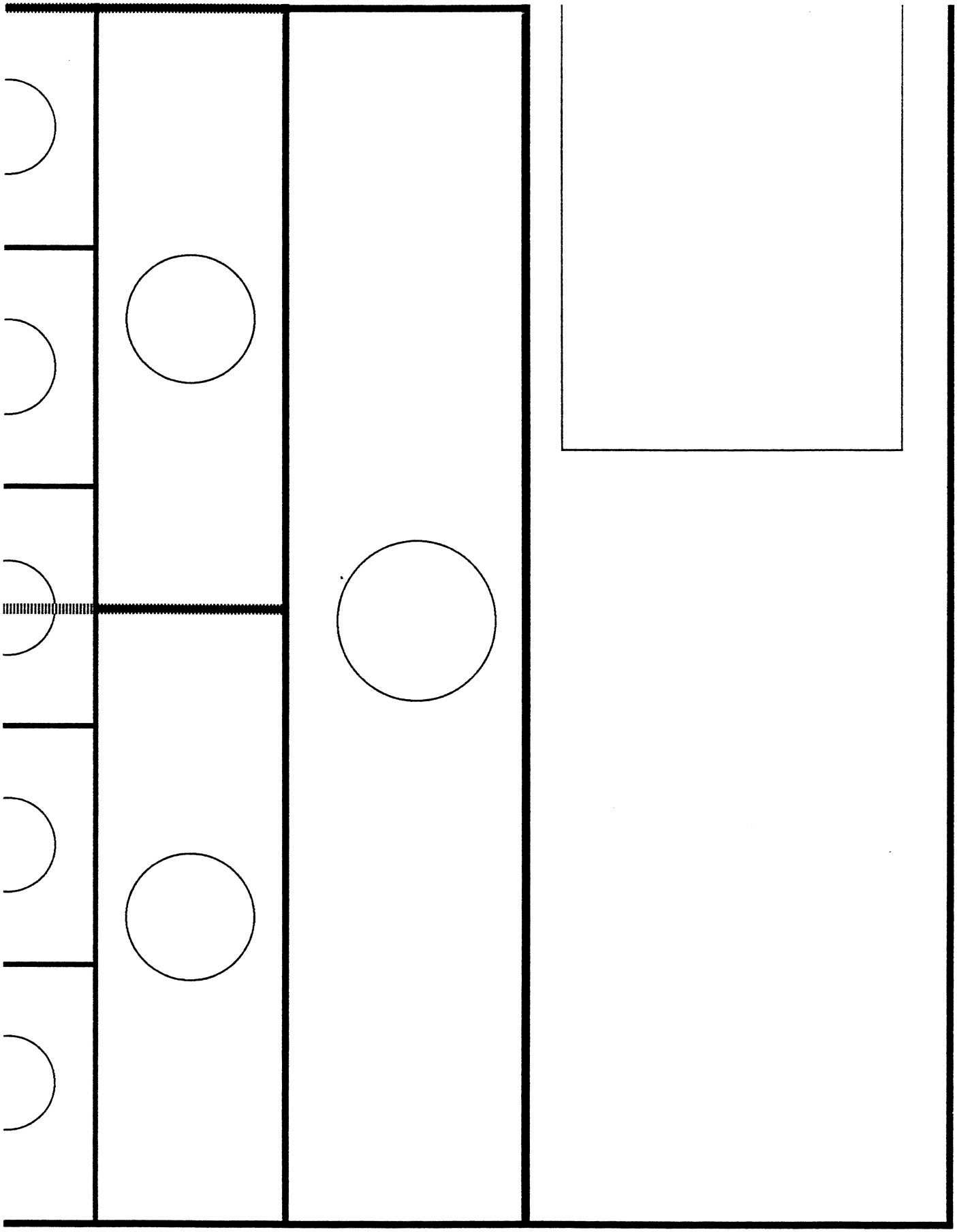


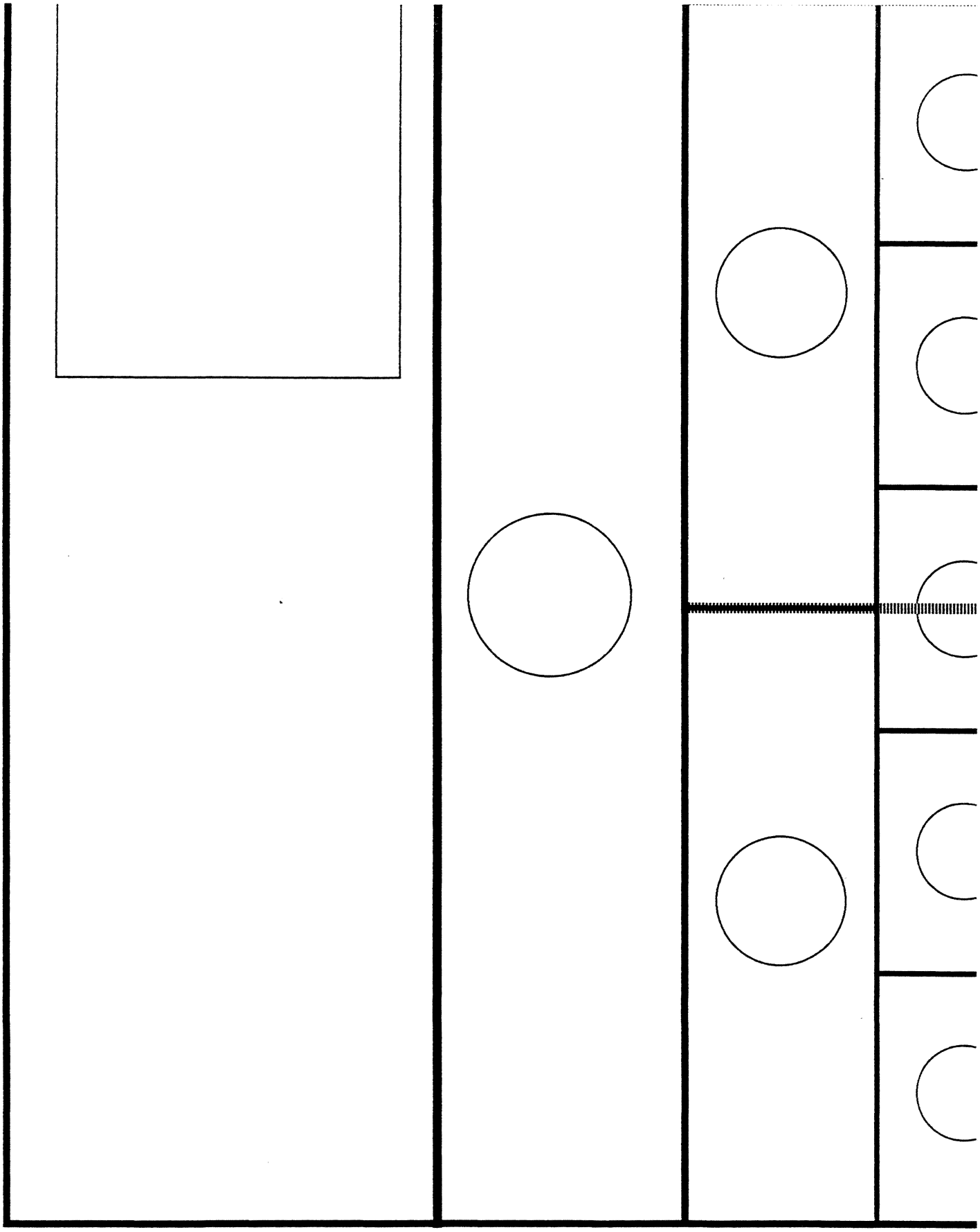


dollar	one hundred cents	$1.00
half-dollar	fifty cents	$ .50
quarter	twenty-five cents	$ .25
dime	ten cents	$ .10
nickel	five cents	$ .05
penny	one cent	$ .01









Money Commands

(Answers are to be stamped or written, as required, on the reverse of each card.)

Remove a quarter, two dimes and a nickel from the container of coins. Count the total amount of these coins.

Use the fewest possible coins to compose 26 cents.

Find the coin that is equivalent to two dimes and five pennies.

Use four different coin combinations to make ten cents.

Change a dollar into six coins whose total value is equivalent to a dollar.

Find the coin that is equivalent to two quarters.

Remove a half dollar, a quarter, a dime, a nickel and four pennies from the container of coins. Count the total amount of these coins.

Money Word Problems

Without Changing

Mother bought apples for $2.15 and bananas for $1.22. What was the total amount?

Two children had boxes of crayons which cost $1.23 each. How much did the two boxes cost?

A child has four pieces of candy which cost a total of $0.84. How much did each piece cost?

Father bought tools for $10.00 and paid for them with a twenty dollar bill. How much change did he receive?

With Changing

Grandmother bought a dress for Pam which cost $25.98 and hat which cost $5.50. What was the total amount spent?

For the party, we bought eight balloons which cost twenty-five cents each. How much did we spend for balloons?

You have $11.30 to spend for two birthday gifts of equal value. How much can you spend for each gift?

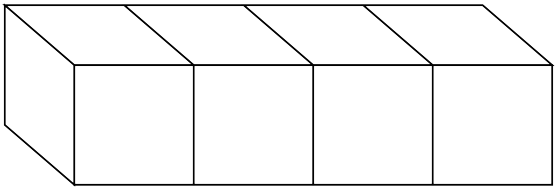
Your allowance is $5.00 per week. You save $1.25 each week. How much money do you have to spend?

$.06	$.15	$.02	$1.10	$.55
$2.00	$.30	$.26	$.06	$.50
$.75	$.10	FREE	$1.01	$.51
$.11	$1.25	$.60	$1.05	$1.00
$1.01	$.20	$.35	$1.50	$.75

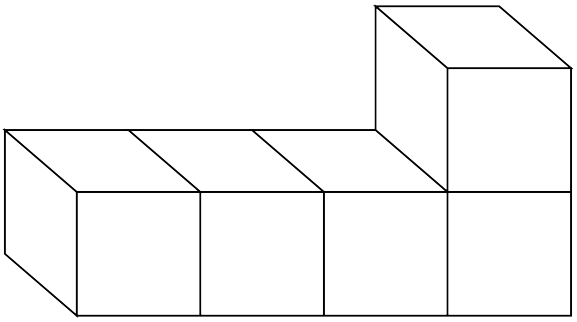
Abbreviations

teaspoon	t.	millimeter	mm
tablespoon	T.	centimeter	cm
cup	C.	decimeter	dm
pint	pt.	meter	m
quart	qt.	kilometer	km
gallon	gal.	ounce	oz.
milliliter	ml	pound	lb.
cubic centimeter	cc	ton	t.
centiliter	cl	milligram	mg
liter	l	gram	g
inch	in.	kilogram	kg
foot	ft.	Fahrenheit	F
yard	yd.	Celsius	C
mile	mi.		

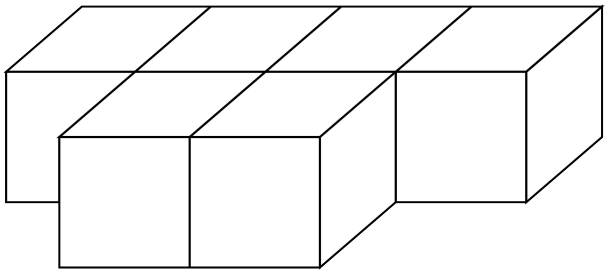
1. Using the cubes, construct the figure and find its volume.



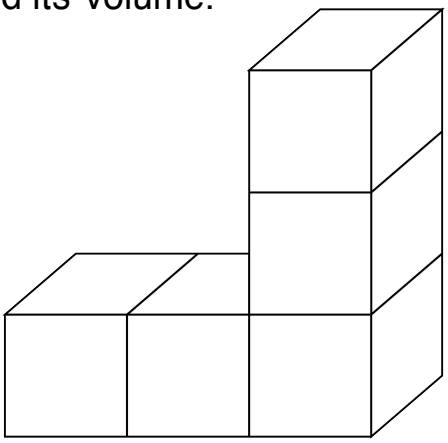
2. Using the cubes, construct the figure and find its volume.



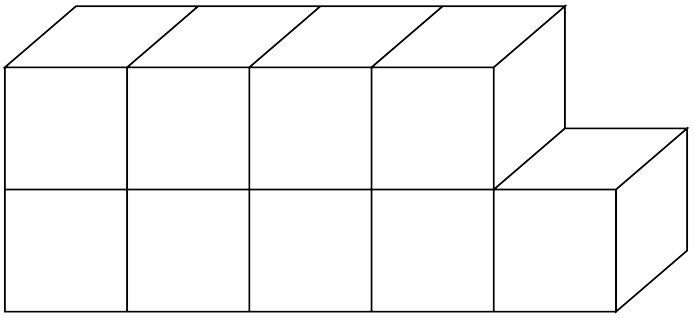
3. Using the cubes, construct the figure and find its volume.



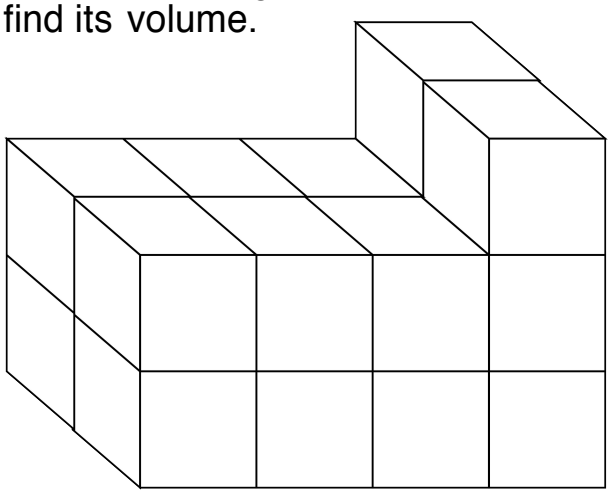
4. Using the cubes, construct the figure and find its volume.



5. Using the cubes, construct the figure and find its volume.



6. Using the cubes, construct the figure and find its volume.



Linear Measurement

Measure the lengths of all the numeral rods and record .

Have a friend measure your height on the first day of each month, and record the measurement along with the date.

Make a meter tape by marking one meter of ribbon into decimeters and labeling each with the number of centimeters (10, 20, 30, etc.). Use this tape to measure items at home.

Measure the width of a door and record.

Measure the length of the longest pencil you can find and record.

Measure five pieces of paper and write the dimensions on each.

Measure the length of a table and record.

Measure the height of a chair and record.

Choose a measuring device suitable for measuring the length and width of the room. Record these dimensions in your measurement booklet.

Decide which item in the classroom is the widest.
Measure its width and record the dimensions, naming that which was measured.

Decide which item in the classroom is the smallest that can be measured with an outside caliper.
Measure it and record the dimensions, naming that which was measured.

Measure the globe at the Equator and record. Try to locate the actual distance in miles or kilometers in an atlas.

Measure the entire length of the time line for pre-history and record.

Measure the distance on the globe from the North Pole to the South Pole.
Try to locate the real distance in miles or kilometers in an atlas.

Determine which part of your body is the largest and which is the smallest by measuring your head, neck, chest, waist, hips, wrist, ankle.
Record all of your measurements along with the date and compare with those of your friends or with your own in a few months.

Volumetric Measurement

Add measured cups of water to the vessel calibrated for one pint. Record the number of cups in a pint.

Add measured cups of water to the vessel calibrated for one quart. Record the number of cups in a quart.

Add measured cups of water to the vessel calibrated for one gallon. Record the number of cups in a gallon.

Add measured quarts of water to the vessel calibrated for one gallon. Record the number of quarts in a gallon.

Add measured quarts of water to the vessel calibrated for one liter. Record your observation.

Determine the number of tablespoons in a one cup measure by adding level tablespoons of a dry substance. Record the number of tablespoons in a cup.

Gravimetric Measurement

Weigh 1/2 cup of each of several liquids sealed in identical small labeled jars. Record the names of the liquids along with their weights.
Note: Liquids may be rubbing alcohol, salad oil, water, vinegar, white corn syrup

Weigh identical sealed containers of air, sand, gravel, soil and record the names of the substances along with their weights.

Weigh the smallest circle in the geometric cabinet and record its weight.

Weigh a ten bar and record its weight.

Find a small item in the classroom that weighs one gram. Record the name of the item.

Find an item in the classroom that weighs one hundred grams. Record its name.

THERMAL MEASUREMENT COMMANDS

Place one thermometer in the sun.
Place an identical thermometer in a shady place.
Set a timer for five minutes.
Record the temperature on each thermometer, noting which was in the sun.

Place two identical thermometers in the sun.
Cover one with a piece of black cloth.
Cover the other with a piece of white cloth.
Set a timer for five minutes.
Record the temperature on each thermometer, noting the color of cloth covering each.

Place one thermometer in a tall container of water.
Place an identical thermometer in an identical container of ice.
Set a timer for five minutes.
Record the temperature on each thermometer, noting which was in ice.

Obtain two identical tall containers of ice.
Place a thermometer with the Celsius scale in one and a thermometer with a Fahrenheit scale in the other.
Set a timer for ten minutes.
Record the temperature on each thermometer, using the appropriate symbols, F or C.

Place one thermometer on a window sill outside the room.
Place an identical thermometer on the sill of the same window inside the room.
Set a timer for ten minutes.
Record the temperatures, noting the location of each.

Obtain two containers of ice.
Place identical Celsius thermometers in each.
Add four tablespoons of salt to one of the containers and label it 4 T.
Set a timer for five minutes.
Record the temperatures, noting which was in the ice containing salt.

Volumetric Measurement Problems

1t. + 2t.=

9T. + 7T.=

1 C. + 1 C. =

4 T. + 24 t. =

1 C. - 10 T. =

1 qt. - 1 pt. =

1 T. - 2 t. =

1 l - 250 ml=

1 T .x 16 =

2 C. X 2=

1 qt. X 4 =

100 mlx 10 =

16 qts. + 4 =

1 l + 2 =

1 C.+ 4 =

1 pt. + 2 =

Linear Measurement Problems

1 ft. + 2 ft. =

12 in. x 3 =

6 1/2 in. + 5 1/2 in. =

50m x 20=

35 cm+ 65 cm=

528 ft. x 10=

1 ft. 6 in. + 2 ft. 9 in. =

10 cm x 10 =

4 ft. - 12 in. =

36 in. + 3 =

148 cm -48 cm =

1 k + 10 =

15 in. -3 in. =

1 mi. + 5 =

1K-450m=

1 dm + 10 =

Area Commands

1. Construct a figure that is 2 units high and 3 units wide. What is the area?

2. Construct a figure that is 9 units high and 2 units wide. What is the area?

3. Construct a figure that is 4 units high and 1 unit wide. What is the area?

4. Construct a figure that is 5 units high and 5 units wide. What is the area?

5. Construct a figure that is 3 units high and 6 units wide. What is the area?

6. Construct a figure that is 7 units high and 2 units wide. What is the area?

7. Construct a figure that is 2 units high and 7 units wide. What is the area?

8. Construct a figure that is 4 units high and 4 units wide. What is the area?

9. Construct a figure that is 10 units high and 3 units wide. What is the area?

10. Construct a figure that is 5 units high and 6 units wide. What is the area?

11. Construct a figure that is 6 units high and 4 units wide. What is the area?

12. Construct a figure that is 12 units high and 2 units wide. What is the area?

13. Construct a figure that is 3 units high and 8 units wide. What is the area?

14. Construct a figure that is 1 unit high and 2 units wide. What is the area?

15. Construct a figure that is 4 units high and 10 units wide. What is the area?

16. Construct a figure that is 7 units high and 5 units wide. What is the area?

17. Construct a figure that is 5 units high and 8 units wide. What is the area?

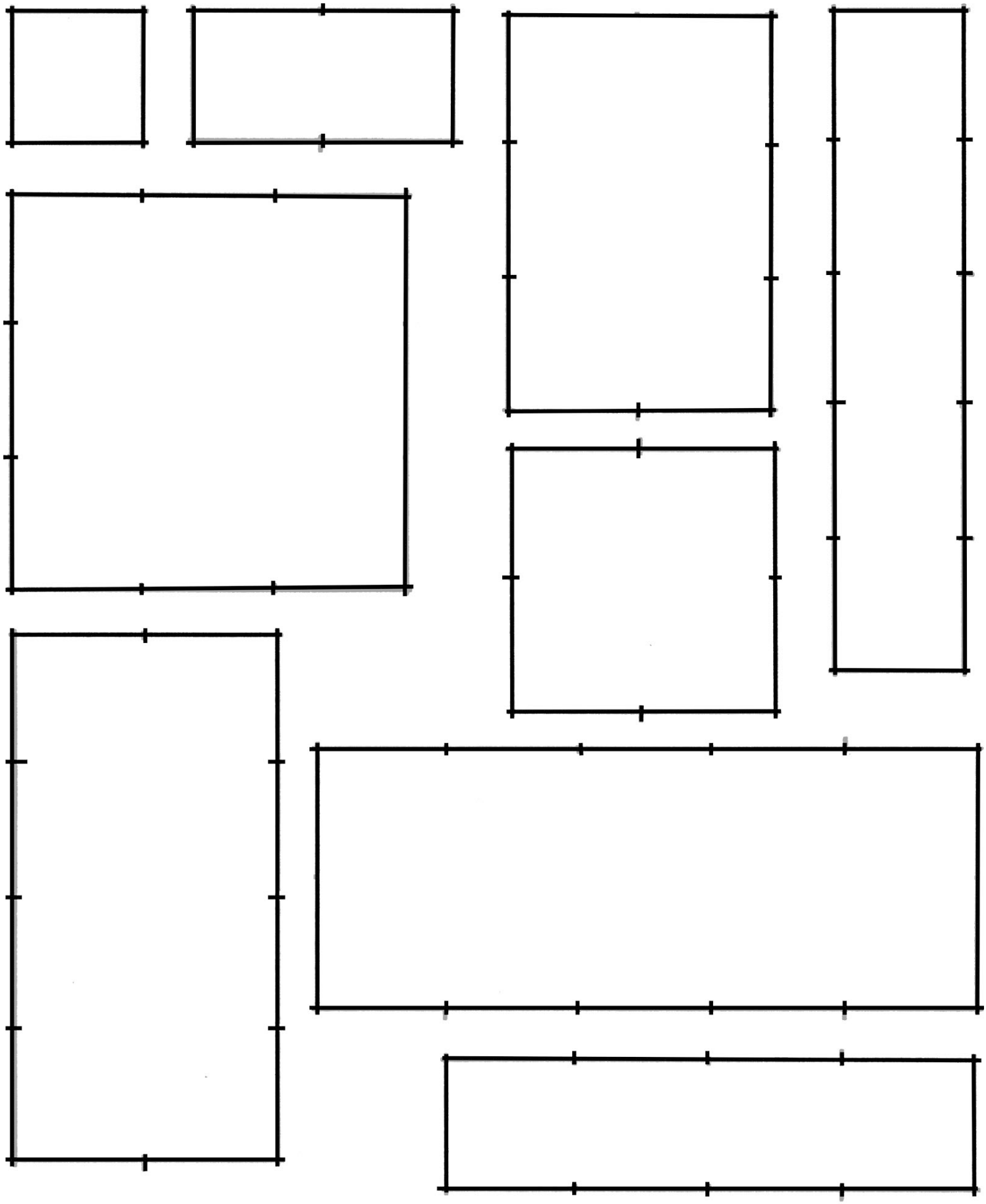
18. Construct a figure that is 3 units high and 9 units wide. What is the area?

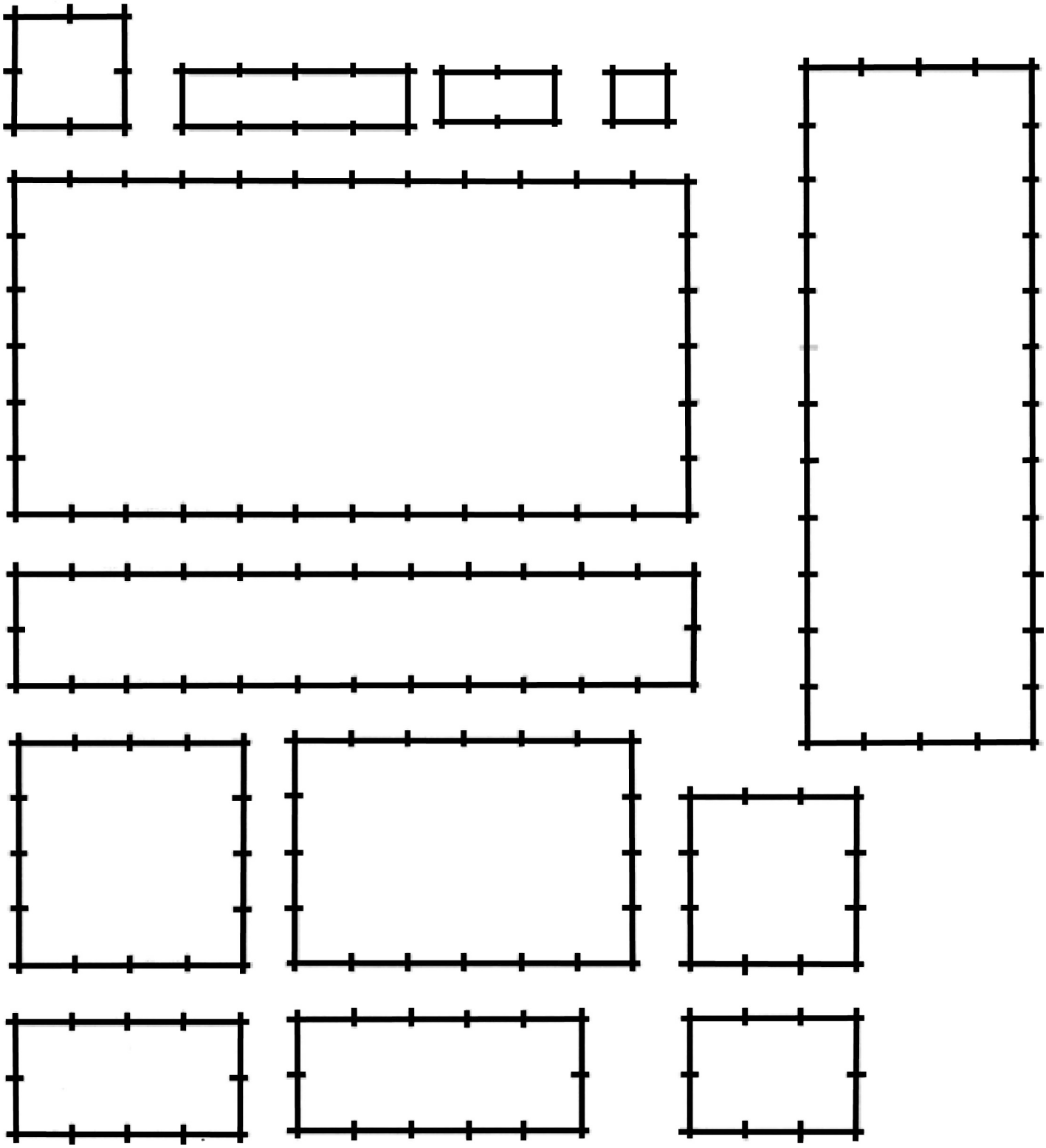
19. Construct a figure that is 6 units high and 6 units wide. What is the area?

20. Construct a figure that is 3 units high and 3 units wide. What is the area?

Answers:

1. 6 square units
2. 18 square units
3. 4 square units
4. 25 square units
5. 18 square units
6. 14 square units
7. 14 square units
8. 16 square units
9. 30 square units
10. 30 square units
11. 24 square units
12. 24 square units
13. 24 square units
14. 2 square units
15. 40 square units
16. 35 square units
17. 40 square units
18. 27 square units
19. 36 square units
20. 9 square units





Commands for Perimeter

1. Find the perimeter of each figure in the drawer of rectangles in the geometric cabinet.

2. Find the perimeter of the largest rectangular table in the class.

3. Find the perimeter of the Canadian flag.

4. Find the perimeter of the world puzzle map.

5. Find the perimeter of the atlas.

6. Find the perimeter of the cubing material box.

7. Find the perimeter of the alphabet box.

8. Find the perimeter of a rug.

9. Find the perimeter of the golden bead mat.

10. Find the perimeter of the largest peg board.

11. Find the perimeter of the division chart.

12. Find the perimeter of the multiplication board.

13. Find the perimeter of the subtraction chart.

14. Find the perimeter of a metal inset frame.

15. Find the perimeter of the equilateral triangle in the geometric cabinet.

16. Find the perimeter of a drawer in the geometric cabinet.

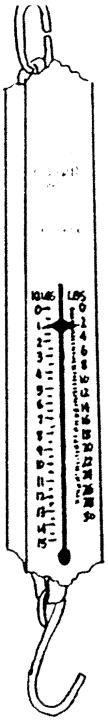
17. Find the perimeter of a wooden thousand cube.

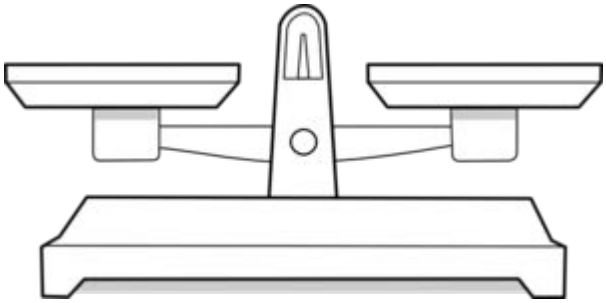
18. Find the perimeter of a label for the parts of a tree cards.

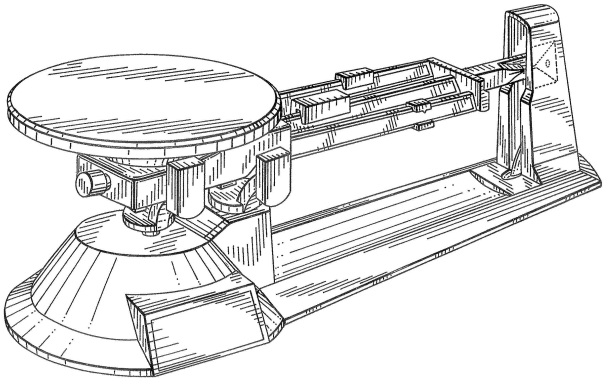
19. Find the perimeter of a tile in the stamp game.

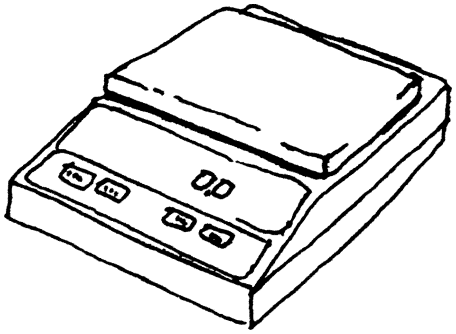
20. Find the perimeter of a wooden numeral card for twenty.

21. Find the perimeter of a golden bead holder.







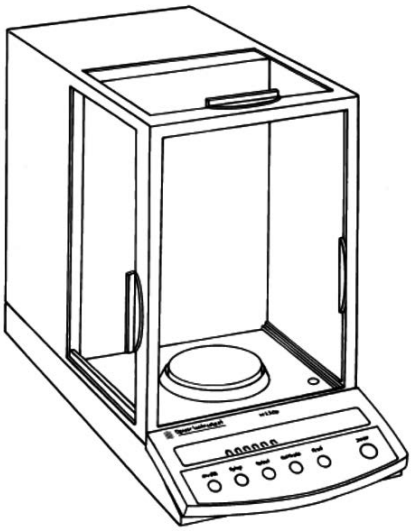


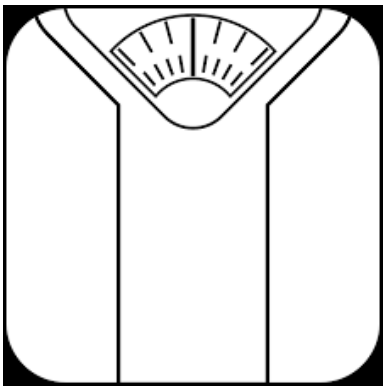
spring scale

double beam balance

triple beam balance

electronic balance





analytical balance

bathroom scale

Thermometry

Galileo, an Italian scientist, invented the thermometer in 1592. The first thermometer was a thermoscope. It measured changes in temperature, but had no scale to give the temperature in degrees.

The thermoscope was constructed with a large glass bulb having a long, narrow neck. The open end of the neck was placed in a container of wine with the bulb suspended above.

When the bulb was warmed, the air in it expanded. This forced the liquid in the neck downward.

When the bulb was cooled, the air in it contracted. This caused the liquid to rise in the neck.

In 1611, a colleague of Galileo, Sanctorius, provided a scale for the thermoscope. He marked the level of the liquid in the neck when the bulb was surrounded by melting snow.

The level of the liquid was marked when the bulb was heated by a candle.The distance between the two marks was divided into 110 equal parts.

In 1632, Jean Rey, a French physician, invented a thermometer with liquid instead of air to record temperature changes. A flask with a long, slender neck was filled with water to a level about half-way up the neck.

When the liquid in the flask became warmer, the liquid expanded and the level rose higher in the neck.

When the liquid in the flask became cooler, the liquid contracted, making it drop to a lower level.

In 1644, Duke Ferdinand II of Tuscany sealed the end of the thermometer designed by Rey. This prevented the interference of barometric pressure with the liquid level in the neck.

In 1657, Ferdinand established the Accademia del Cimento in Florence, Italy, to manufacture thermometers of uniform dimensions. Thermometric experiments were conducted.

Mercury was used in some of the thermometers. Wine was preferred because it has a larger expansion coefficient. This means that wine expands more than mercury when the temperature increases.

In Paris in 1672, Hubin invented an air thermometer which overcame the influence of atmospheric pressure. Two liquids were used with two sealed bulbs connected by a U tube. Mercury and copper nitrate solution were the liquids.

Temperature Scales

Fahrenheit Scale

About 1700, Ole Romer, a Danish astronomer, calibrated a thermometer at two temperatures. The space or interval between these two fiduciary marks was divided into equal parts. These equal parts were extended beyond the fiduciary marks by extrapolation.

Between 1700 and 1730, a Dutch instrument maker, Daniel Gabriel Fahrenheit, produced fine quality mercury thermometers. These were based on Romer's work.

Fahrenheit determined that 32 degrees was the melting point of ice and that 96 degrees was blood heat. The boiling temperature of water was determined to be 212 degrees.

The unit of temperature is 11180th of the difference between the boiling point of water and the freezing point of water.

Celsius Scale

In 1742, a Swedish astronomer, Anders Celsius, developed a new scale for measuring temperature. A mercury thermometer was used.'

One hundred degrees was determined to be the boiling point of water. Zero degrees was determined to be the freezing point of water.

This scale was known as the centigrade scale until 1948 when its name was officially changed to Celsius in honor of its originator.

Absolute Temperature Scale

About 1800, Jacques-Alexandre-Cesar Charles experimented with volumes of gas at different temperatures and constant pressures. He found that -273.15 degrees Celsius is the lowest temperature possible.

All substances at -273.15 degrees Celsius change to either a liquid or a solid. All motion of molecules stops.

Charles formulated a general gas law. If either the pressure or volume of a given quantity of gas is held constant, temperature may be determined. Charles' Law is represented by this equation .

$$\frac{PV}{T} = \text{constant}$$

Kelvin Scale

In 1848, William Thomson (Lord Kelvin), developed a thermodynamic temperature scale. He was a British physicist who based his work on the "ideal heat engine". This had been described by Sadi Carnot, a French physicist, in 1824.

A heat engine is a machine which converts heat into mechanical work. Examples are a steam engine and a gasoline engine such as in a car.

Lord Kelvin used the Celsius principle of the difference between freezing and boiling points of water as 100 Kelvin or 100 K.

THERMAL MEASUREMENT COMMANDS

Place one thermometer in the sun. Place an identical thermometer in a shady place.
Set a timer for ten minutes.
Record the temperature on each thermometer, noting which was in the sun.

Place two identical thermometers in the sun.
Cover one with a piece of black cloth.
Cover the other with a piece of white cloth.
Set a timer for ten minutes.
Record the temperature on each thermometer, noting the color of cloth covering each.

Place one thermometer in a tall container of water.
Place an identical thermometer in an identical container of ice.
Set a timer for ten minutes. Record the temperature on each thermometer, noting which was in ice.

Obtain two identical tall containers of ice.
Place a thermometer with the Celsius scale in one and a thermometer with a Fahranheit scale in the other.
Set a timer for ten minutes.
Record the temperature on each thermometer, using the appropriate symbols, F or C.

Place one thermometer on a window sill outside the room.
Place an identical thermometer on the sill of the same window inside the room.
Set a timer for ten minutes.
Record the temperatures, noting the location of each.

Obtain two containers of ice.
Place identical Celsius thermometers in each.
Add two tablespoons of salt to one of the containers and label it 2 T.
Add four tablespoons of salt to the other container and label it 4T.
Set a timer for ten minutes.
Record the temperatures, noting the amount of salt for each.

Liquid-in-glass Thermometer

Mercury is the most common liquid used in thermometers. It is contained in a glass bulb with a sealed tube to which a scale is attached.

When the temperature increases, the mercury expands, causing it to move up the tube.

When the temperature decreases, the mercury contracts, causing it to move down the tube.

By looking at the place on the scale where the column of mercury ends, the temperature can be read.

Bimetal Strip Thermometer

Two strips of different metals are bonded together. One metal may be invar, an alloy of iron and nickel. The other metal may be brass.

The strip is wound in a spiral to take up less room. One end is attached to a rigid backing.

A temperature change makes one metal expand or contract more quickly than the other. This causes the unattached end to move.

A pointer attached to the free end moves across a graduated scale to indicate the temperature.

Digital Thermometer

Change in temperature is measured by electrical resistance in a metal probe.

An electronic circuit is attached to the probe. Temperature reading is received into the circuit by electrical signals.

The electrical signals are displayed as numbers through a small window.

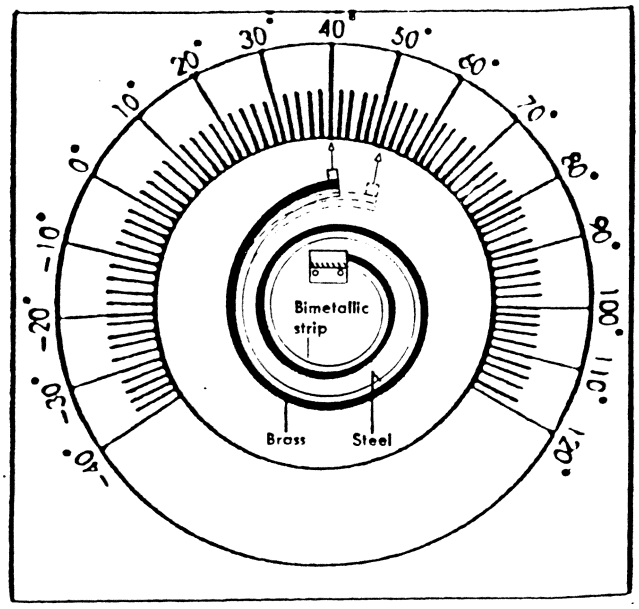
Liquid Crystal Thermometer

A liquid crystal substance flows like a liquid. Within a certain temperature range, it also has crystal-like properties.

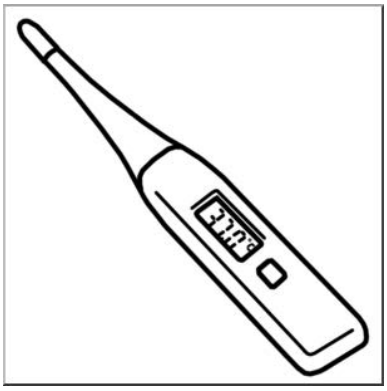
Liquid crystal substances may be brightly colored. Change in temperature causes a color change. The change in color indicates the temperature.

Other kinds of thermometers are:

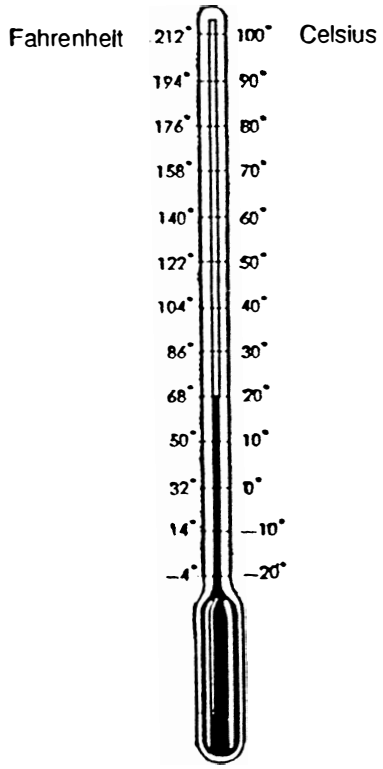
clinical thermometer
magnetic thermometer
acoustic thermometer resistance
thermometer thermal noise
thermometer
gas viscosity thermometer
pyroelectric thermometer optical
pyrometer
sonic pyrometer
infrared pyrometer thermograph
thermocouple
Bourdon tube



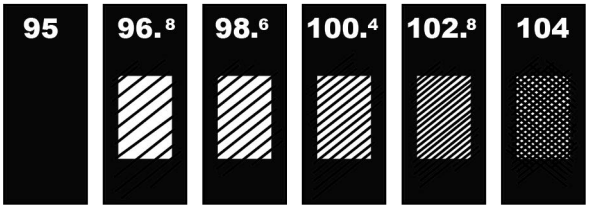
bimetallic thermometer



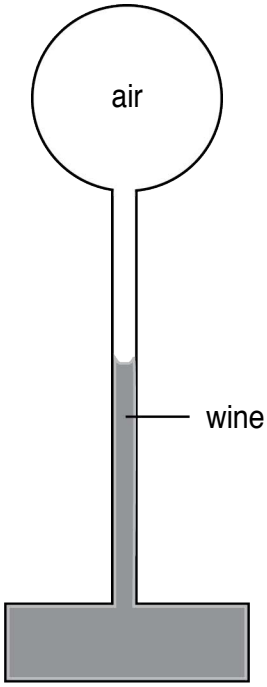
digital thermometer



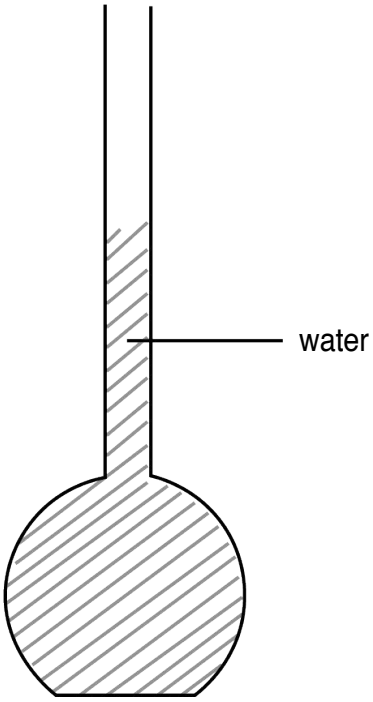
liquid-in-glass thermometer



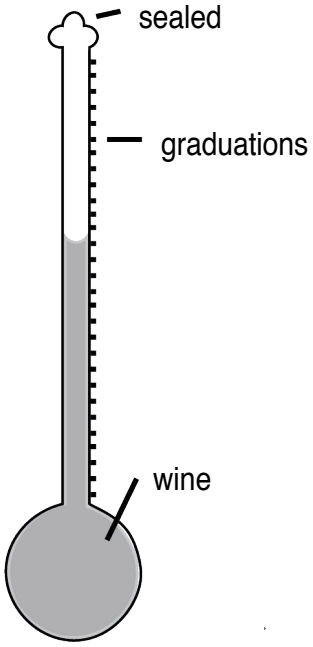
liquid crystal thermometer



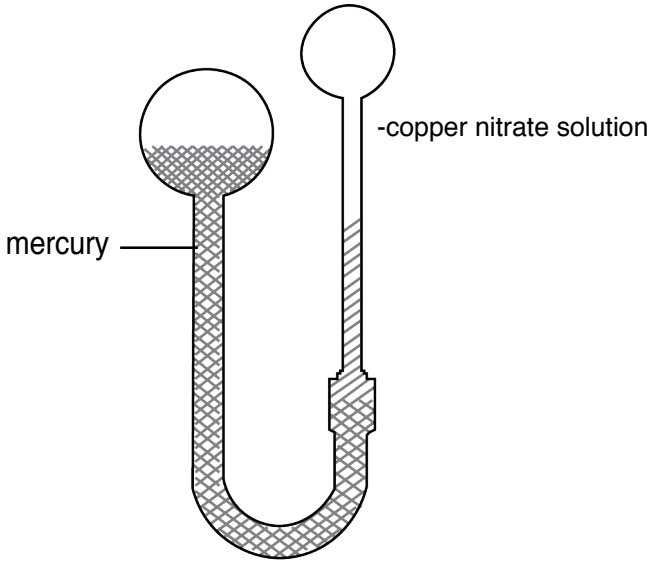
Galileo's thermoscope



Rey's first liquid thermometer



Early Florentine thermometer



Hubin's first sealed air thermometer

12:00	twelve o'clock
1:00	one o'clock
2:00	two o'clock
3:00	three o'clock
4:00	four o'clock
5:00	five o'clock
6:00	six o'clock
7:00	seven o'clock
8:00	eight o'clock

9:00	nine o'clock
10:00	ten o'clock
11 :00	eleven o'clock
12:30	half past twelve
1:30	half past one
2:30	half past two
3:30	half past three
4:30	half past four
5:30	half past five

6:30	half past six
7:30	half past seven
8:30	half past eight
9:30	half past nine
10:30	half past ten
11:30	half past eleven
9:15	quarter past nine
3:15	quarter past three
5:15	quarter past five

6:15	quarter past six
8:15	quarter past eight
12:45	quarter 'til one
2:45	quarter 'til three
11 :45	quarter 'til twelve
4:45	quarter 'til five
7:45	quarter 'til eight
6:01	
6:09	

6:10

6:15

6:22

6:28

6:30

6:36

6:40

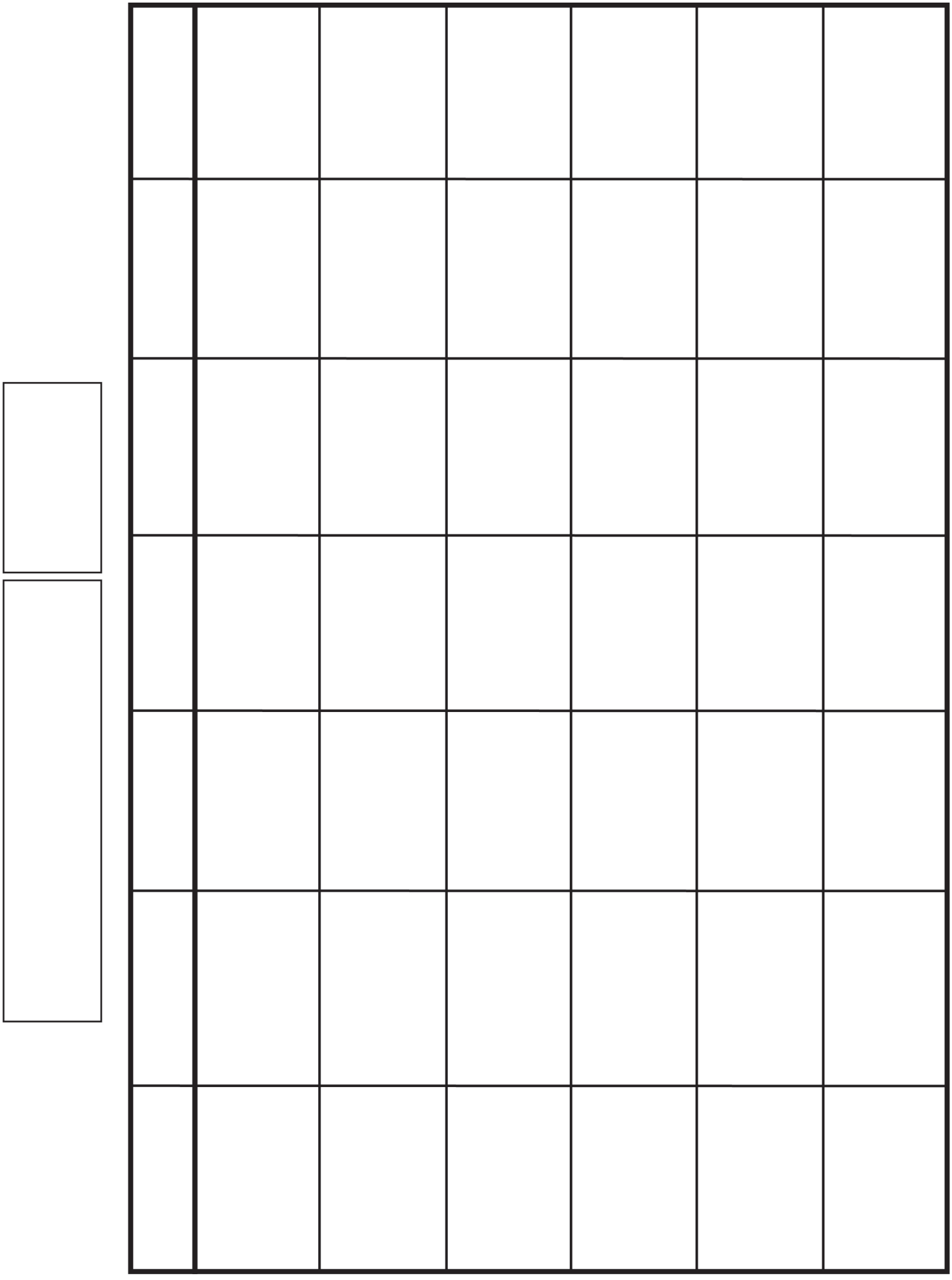
6:45

6:50

6:58

6:54

6:53



Monday	Tuesday	Wednesday	Thursday	Friday
1	8	15	22	29
2	9	16	23	30
3	10	17	24	31
4	11	18	25	Saturday
5	12	19	26	Sunday
6	13	20	27	
7	14	21	28	

1999

2000

2001

2002

2003

2004

2005

2006

January	July
February	August
March	September
April	October
May	November
June	December

minute

One minute is composed of 60 seconds.

hour

One hour is composed of 60 minutes.

Hourly means once evey hour.

day

One day is compsed of 24 hours, the time it takes Earth to rotate one time on its axis. Daily means once a day.

week

One week is composed of 7 days.
Weekly means once a week.

month

One month is composed of from 28 to 31 days.
Thirty days hath September, April, June and November,
All the rest have thirty-one except for February
Which has twenty-eight or in leap year twenty-nine.
Monthly means once a month.

year

One year is composed of 12 months or 52 weeks or 365 days except in leap year when there are 366 days. Leap year happens every 4 years when one day is added. This difference is due to the fact that Earth revolves around the sun once every 365 1/4 days, but the year is calculated at 365 days.
Yearly means once a year. Annually means the same as yearly.

decade

One decade is composed of 10 years.

century

One century is composed of 100 years.

millennium

One millennium is composed of 1000 years.

Biweekly, bimonthly and biannually refer to an event that occurs twice in a week, a month or a year.

Semiannually means the same as biannually.

polygon
closed plane composed of line segments which enclose it

quadrilateral
polygon having four sides

common quadrilateral
polygon having four sides, none of which are parallel

parallelogram
quadrilateral having two pairs of parallel sides

rectangle
parallelogram having opposite sides equal and four right angles

square
parallelogram having equal sides and four right angles

rhombus
parallelogram having four equal sides and four oblique angles

trapezoid
quadrilateral having one pair of opposite sides parallel

isosceles trapezoid
trapezoid having two equal sides which are not parallel

right-angled trapezoid
trapezoid having one right angle

scalene trapezoid
trapezoid with no equal sides

triangle
polygon having three sides

equilateral triangle
triangle having three equal sides and three equal angles

right triangle
triangle having a right angle

acute triangle
triangle having all acute angles

obtuse triangle
triangle having an obtuse angle

scalene triangle
triangle having no equal sides

isosceles triangle
triangle having two equal sides

right-angled scalene triangle
triangle having a right angle and no equal sides

obtuse-angled scalene triangle
triangle having an obtuse angleand no equal sides

acute-angled scalene triangle
triangle having acute angles and noequal sides

right-angled isosceles triangle
triangle having a right angle and twoequal sides

obtuse-angled isosceles triangle
triangle having an obtuse angle and two equal sides

acute-angled isosceles triangle
triangle having acute angles and two equal sides

pentagon
polygon having five sides

hexagon
polygon having six sides

heptagon or septagon
polygon having seven sides

octagon
polygon having eight sides

nonagon
polygon having nine sides

decagon
polygon having ten sides

simple closed curve
plane enclosed by a curved line

circle
simple closed curved having equal distance from the center

ellipse
simple closed curve having the same shape at each end

oval
simple closed curve having one end smaller than the other

rhomboid
a parallelogram with only the opposite sides equal and four oblique angles

rhombus
a parallelogram with four equal sides and four oblique angles

polygon

quadrilateral

common quadrilateral

parallelogram

rectangle

square

rhombus

trapezoid

isosceles trapezoid

right-angled trapezoid

scalene trapezoid

triangle

equilateral triangle

right triangle

acute triangle

obtuse triangle

scalene triangle

isosceles triangle

right-angled scalene triangle

obtuse-angled scalene triangle

acute-angled scalene triangle

right-angled isosceles triangle

obtuse-angled isosceles triangle

acute-angled isosceles triangle

pentagon

hexagon

heptagon or septagon

octagon

nonagon

decagon

simple closed curve	
	closed plane composed of line segments which enclose it
circle	
ellipse	
	polygon having four sides
oval	
rhomboid	
rhombus	**polygon having four sides, none of which are parallel**
	quadrilateral having two pairs of parallel sides

parallelogram having opposite sides equal and four right angles

trapezoid having two equal sides which are not parallel

parallelogram having equal sides and four right angles

trapezoid having one right angle

parallelogram having four equal sides and four oblique angles

trapezoid with no equal sides

quadrilateral having one pair of opposite sides parallel

polygon having three sides

triangle having three equal sides and three equal angles

triangle having no equal sides

triangle having a right angle

triangle having two equal sides

triangle having all acute angles

triangle having a right angle and no equal sides

triangle having an obtuse angle

triangle having an obtuse angle and no equal sides

triangle having acute angles and no equal sides

triangle having a right angle and twoequal sides

triangle having an obtuse angle and two equal sides

triangle having acute angles and two equal sides

polygon having five sides

polygon having six sides

polygon having seven sides

polygon having eight sides

polygon having nine sides

simple closed curve having the same shape at each end

polygon having ten sides

simple closed curve having one end smaller than the other

plane enclosed by a curved line

a parallelogram with only the opposite sides equal and four oblique angles

simple closed curved having equal distance from the center

a parallelogram with four equal sides and four oblique angles

1

1. Remove any drawer from the geometric cabinet.
2. Lay out the corresponding cards that have the solid figures.
3. Place the geometric insets on appropriate cards to cover the solid figure.

2

1. Remove any drawer from the geometric cabinet.
2. Lay out the corresponding cards that have the figures with thick lines.
3. Place the geometric insets on appropriate cards to cover the thick line.

3

1. Remove any drawer from the geometric cabinet.
2. Lay out the corresponding cards that have the figures with thin lines.
3. Place the geometric insets on appropriate cards to cover the thin line.

4

In the geometric cabinet, locate all the forms with curved sides and count them.

5

In the geometric cabinet, locate all the forms with straight sides and count them.

6

In the geometric cabinet, locate all the forms with three sides and count them.

7

In the geometric cabinet, locate all the forms with four sides and count them.

8

In the geometric cabinet, locate all the forms with five or more sides and count them.

9

In the geometric cabinet, locate all the circles and count them.

10

In the geometric cabinet, locate all the squares and count them.

11

In the geometric cabinet, locate all the triangles in the geometric cabinet and count them.

12

In the geometric cabinet, locate all the rectangles and count them.

13

In the geometric cabinet, locate all the quadrilaterals and count them.

14

In the geometric cabinet, locate all the polygons and count them.

15

In the geometric cabinet, locate all the forms with three angles and count them.

16

In the geometric cabinet, locate all the forms with four angles and count them.

17
In the geometric cabinet, locate all the forms with five or more angles and count them.

18
Remove the drawer of circles from the geometric cabinet and grade them from largest to smallest.

19
Remove the drawer of rectangles from the geometric cabinet and grade them from wide to narrow.

20
Remove the drawer of polygons from the geometric cabinet and grade them from five to ten sides.

21
Remove the drawers containing regular polygons from the geometric cabinet and grade them from three to ten sides.

22
Remove the drawers containing regular polygons from the geometric cabinet and grade them from three to ten angles.

23
1. In a row, draw an outline of each of the geometric insets for design on the same sheet of paper.
2. Place similar forms from the geometric cabinet in a column in front of the outline drawings.

24
Make a list of all the items in the classroom that have a circular shape.

25
Make a list of all the items in the classroom that have a rectangular shape.

26
Make a list of all the items in the classroom that have a triangular shape.

27
Remove and label the geometric forms in the drawer of circles from the geometric cabinet.

28
Remove and label the geometric forms in the drawer of rectangles from the geometric cabinet.

29
Remove and label the geometric forms in the drawer of triangles from the geometric cabinet.

30
Remove and label the geometric forms in the drawer of quadrilaterals from the geometric cabinet.

31
Remove and label the geometric forms in the drawer of polygons from the geometric cabinet.

32
Remove and label the geometric forms in the drawer of cuNed figures from the geometric cabinet.

33
Remove and label the geometric forms in all drawers from the geometric cabinet.

34
1. Arrange the bases for the geometric solids horizontally on a table
2. Locate these forms in the geometric cabinet drawers, then place each in front of the corresponding base.

35
1 Arrange the bases for the geometric solids horizontally on a table.
2. Place appropriate labels in front of each of the bases.

36
1. Remove all geometric forms with curved sides from the geometric cabinet.
2. Label each form just removed.

37
1. Remove the geometric forms with straight sides from the geometric cabinet.
2. Label each form just removed.

38
1. Remove the geometric forms with three sides from the geometric cabinet.
2. Label each form just removed.

39
1. Remove the geometric forms with four sides from the geometric cabinet.
2. Label each form just removed.

40
1. Remove the geometric forms with five or more sides from the geometric cabinet.
2. Label each form just removed.

41
1. Remove the geometric forms with three angles from the geometric cabinet.
2. Label each form just removed.

42
1. Remove the geometric forms with four angles from the geometric cabinet.
2. Label each form just removed.

43
1. Remove the geometric forms with five or more angles from the geometric cabinet.
2. Label each form just removed.

44
1. Remove one drawer at a time from the geometric cabinet.
2. Prepare your own labels for the forms and place in an envelope labeled "Geometric Forms" and mark with your name.

45
1. Invite a friend who knows the names of the forms in the geometric cabinet to join you in a matching game.
2. On a table top, turn face down the labels
3. After choosing a label and reading it, turn it face down again.
4. Get the corresponding form, place it on the table, then turn the label face upward in front of the form.
5. The other person repeats the procedure.
6. Take turns until all the labels are placed with forms.

46
1. Using the labels for the geometric cabinet, label the insets for design.

47
1. Using the insets for design, draw an outline of each form.
2. Write the appropriate labels under each drawing.

Exercises with the Triangular Box

One
1. Sort the triangles according to color.
2. Place the same-color triangles so that the black lines touch.
3. Look at the gray equilateral triangle, then look at the triangles just constructed.
4. Record your observations.

Two
1. Sort the triangles according to color.
2. Construct as many shapes as possible by placing the same color triangles together so that no black lines touch.
3. Name the shapes just constructed.
4. Record your observations related to the gray equilateral triangle.

Three
1. Draw around one triangle of each color.
2. Using the labels from the geometric cabinet, label each triangle just drawn.
3. Record your observations of triangles having the same name. Record your observations of their sizes.

Four
1. Sort the triangles by color.
2. Arrange horizontally each component by color, with the gray equilateral first at the left.
3. Using Set 2 of the fraction cards, label each component triangle, with the gray equilateral triangle labeled 1.

Five
1. Construct an equilateral triangle on a sheet of paper, using all ten components from the box.
2. Carefully draw around the triangle just constructed, then return the components to the box.
3. Place the gray equilateral triangle on each angle of the large equilateral triangle, drawing around it with each placement.
4. Count and record the number of equilateral triangles equivalent to the gray equilateral triangle.

Six
1. Sort the triangles by color.
2. Stack the congruent triangles.
3. Observe how many sets of congruent triangles there are and record.

Seven
1. Sort the triangles according to shape, disregarding size.
2. Observe the number of groups of similar triangles and record.

Eight
1. Using the two green right angled triangles, construct a rectangle.
2. Find the area of the rectangle.
3. Using the two green right-angled triangles, construct a larger triangle.
4. Determine if the area of the larger triangle is the same as the area of the rectangle previously constructed with the same two green right-angled triangles and record.

Nine
1. Using the two green right angled triangles, construct a rectangle.
2. Compare the height of the gray equilateral triangle with the rectangle just constructed. Record your observation.
3. Compare the base of the gray equilateral triangle with the rectangle just constructed. Record your observation.

Exercises with the Large Hexagonal Box

One
1. Sort the triangles according to color.
2. Construct geometric shapes by arranging the same-color triangles along the black lines.
3. Using the labels from the geometric cabinet, label the geometric shapes just constructed.

Two
1. Sort the yellow triangles only.
2. Construct a hexagon by following the black lines. Observe the number of triangles used to construct the hexagon.
3. Observe that a triangle is inscribed within the hexagon.
4. Construct an equilateral triangle within the triangle in the hexagon.

Three
1. Sort the triangles according to color.
2. Construct geometric shapes by arranging the same-color triangles along the black lines.
3. Observe the rhombus and the hexagon to determine the comparative areas.
4. Observe the equilateral triangle and the hexagon to determine their comparative areas.
5. Observe the parallelogram and the hexagon to determine their comparative areas.

Four
1. Construct other geometric shapes with the triangles and label them.

Five
1. Construct the largest possible large equilateral triangle and draw around it.
2. Measure one side of this triangle with a ruler.
3. Measure the equilateral triangle previously constructed with the triangles from the triangle box and observe if these two triangles are congruent or similar.

Exercises with the Small Hexagonal Box

One
1. Sort the triangles according to color.
2. Place the same-color triangles so that the black lines touch.
3. Using the labels from the geometric cabinet, label the geometric shapes just constructed.

Two
1. Sort the triangles by color.
2. Stack the congruent triangles.
3. Observe how many sets of congruent triangles there are and record.
4. Observe if there are any similar triangles and record.

Three
1. Sort the triangles according to color.
2. Place the same-color triangles so that the black lines touch.
3. Draw around each geometric shape just constructed and observe the sizes.
4. Confirm your observations by measuring the drawings with a ruler.
5. Inscribe geometric shapes with the triangles within the geometric shapes just drawn and record their names by placing the triangles within the outlines. Observe the geometric shapes superimposed within the drawings.

Four
1. Sort the gray triangles and the green triangles only.
2. Construct a gray hexagon and a green trapezoid.
3. Observe the relationship between the trapezoid and the hexagon and label the trapezoid with fraction cards.

Five

1. Sort the gray triangles and six red isosceles triangles only.
2. Construct a gray hexagon and count the number of gray equilateral triangles required in its construction.
3. Construct a congruent red hexagon.
4. Observe the size of one red isosceles triangle compared with one gray equilateral triangle.
5. Using the fraction cards from Set 1, label each component part of each hexagon.

Six

1. Sort the yellow equilateral triangle and three red isosceles triangles only.
2. Using the three red isosceles triangles, construct an equilateral triangle and observe if it is congruent to the yellow equilateral triangle.
3. Using the fraction cards from Set 1, label the red triangles which compose the larger equilateral triangle.

Seven

1. Sort the triangles according to color.
2. Construct a gray hexagon and compare it to the yellow equilateral triangle.
3. Construct a hexagon with six red isosceles triangles and compare it to the yellow equilateral triangle. Record your observations.
4. Construct a green trapezoid and compare it to the yellow equilateral triangle. Record your observations.

Eight

1. Sort the triangles according to color.
2. Place the same-color triangles so that the black lines touch.
3. Observe the bases of the geometric shapes just constructed and record your comparison.

Nine

1. Sort the triangles according to color.
2. On a sheet of paper, place the same-color triangles so that the black lines touch.
3. Draw around the shapes just constructed, then remove the triangles from the paper.
4. Using same color triangles, inscribe geometric shapes within the drawn outlines and write the names or place labels to identify each.

Ten

1. Lay out the outline drawing of the large equilateral triangle constructed with all the components of the triangle box (Exercise 5 with triangle box).
2. Construct an equilateral triangle congruent to the drawing with the triangles from the small hexagonal box. Not all the triangles will be needed.

Exercises with All Three Boxes

One

1. Remove the contents of the triangle, small hexagonal and large hexagonal boxes.
2. Construct as many different geometric shapes as possible.
3. Group the congruent geometric shapes and record the number.
4. Group the similar geometric shapes and record the number.

Two

1. With the contents of the triangular box, construct one large equilateral triangle near the top of the table.
2. With the contents of the small hexagonal box, construct a triangle congruent to the first construction with its apex touching the lower left angle of the first equilateral triangle.
3. With the large hexagonal box, construct a triangle congruent to the first construction with its apex touching the lower right angle of the first equilateral triangle.
4. Observe the size of the resulting very large equilateral triangle. Determine how many times larger this very large triangle is than any one of the similar triangles within it.
5. Observe the relationship between a small red equilateral triangle and the very large equilateral triangle. This very large triangle is how many times larger than the similar red triangle?

2^3 2^3 2^4 2^5 2^6

2^7 2^8 2^9

$(a+b)^2 = a^2 + 2ab + b^2$

$a2$ ab ab $b2$

$(a + b + c)^2 = a^2 + 2ab + b^2 + 2ac + 2bc + c^2$

a^2 ab ab b^2

ac ac be be $c2$

$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$

$a3$ a^2b a^2b a^2b

ab^2 ab^2 ab^2 b^3

$$(a + b + c)^3 =$$

$$a^3 + 3a^2b + 3ab^2 + b^3 + 3a^2c + 6abc +$$

$$3b^2c + 3ac^2 + 3bc^2 + c^3$$

a^3	a^2b	a^2b	a^2b	ab^2
ab^2	ab^2	b^3	a^2c	a^2c
a^2c	abc	abc	abc	abc
abc	abc	b^2c	b^2c	b^2c
ac^2	ac^2	ac^2	bc^2	bc^2
bc^2	c^3			

regular solids

curved-surface solids

straight-edged, semi-regular solids

flat-based, curved-surface, semi-regular solids

tetrahedron

hexahedron

octahedron

dodecahedron

icosahedron

cone

hemisphere

sphere

cylinder

torus

triangular pyramid

ellipsoid

ovoid

oblate spheroid

hexagonal pyramid

octagonal pyramid

square-based pyramid

hexagonal prism

square-based prism

octagonal prism

triangular prism

parallepi ped

Definitions for Geometric Solids

Regular Solids

regular polyhedron
polyhedron having faces which are congruent regular polygons and congruent angles between the sides

regular tetrahedron
polyhedron having four equilateral triangles as faces

regular hexahedron (cube)
polyhedron having six squares as faces

regular octahedron
polyhedron having eight equilateral triangles as faces

regular dodecahedron
polyhedron having twelve regular pentagons as faces

regular icosahedron
polyhedron having twenty equilateral triangles as faces

Semi-regular Solids with Straight Edges

prism
polyhedron having congruent, parallel bases which are polygons and lateral faces or sides which are parallelograms

right prism
prism having lateral edges and lateral faces which are perpendicular to the bases

parallelepiped
prism having parallelogram bases, thus having all six faces parallelograms

pyramid
polyhedron having a base of any polygon and triangular faces which meet at a common apex or vertex

regular pyramid
pyramid having a regular polygon as a base and lateral edges of equal length

Semi-regular Solids with Straight Edges and Curved Surfaces

cylinder
solid figure having congruent circular bases and curved sides

hemisphere
solid figure consisting of haH a sphere and having a circular base

cone
solid figure having a circular base and a curved surface which tapers evenly to an apex

Curved Surface Solids

sphere
round solid having the surface equidistant from the center at all points

torus
solid having the shape of a doughnut

ellipsoid
solid corresponding to an ellipse having symmetrical top and bottom curved surfaces equidistant from the center and longer symmetrical curved end surfaces equidistant from the center so that the length is greater than the breadth

ovoid
solid having the shape of an egg

oblate spheroid
solid having flattened symmetrical top and bottom curved surfaces equidistant from the center and longer symmetrical curved end surfaces equidistant from the center so that the length is greater than the breadth

Definitions for Geometric Solids

Regular Solids

regular polyhedron

regular tetrahedron

regular hexahedron (cube)

regular octahedron

regular dodecahedron

regular icosahedron

Semi-regular Solids with Straight Edges

prism

right prism

parallelepiped

pyramid

regular pyramid

Semi-regular Solids with Straight Edges and Curved Surfaces

cylinder

hemisphere

cone

Curved Surface Solids

sphere

torus

ellipsoid

ovoid

oblate spheroid

polyhedron having faces which are congruent regular polygons and congruent angles between the sides

polyhedron having four equilateral triangles as faces

polyhedron having six squares as faces

polyhedron having eight equilateral triangles as faces

polyhedron having twelve regular pentagons as faces

prism having parallelogram bases, thus having all six faces parallelograms

polyhedron having twenty equilateral triangles as faces

polyhedron having a base of any polygon and triangular faces which meet at a common apex or vertex

polyhedron having congruent, parallel bases which are polygons and lateral faces or sides which are parallelograms

pyramid having a regular polygon as a base and lateral edges of equal length

prism having lateral edges and lateral faces which are perpendicular to the bases

solid figure having congruent circular bases and curved sides

solid figure consisting of half a sphere and having a circular base

solid figure having a circular base and a curved surface which tapers evenly to an apex

round solid having the surface equidistant from the center at all points

solid having the shape of a doughnut

solid corresponding to an ellipse having symmetrical top and bottom curved surfaces equidistant from the center and longer symmetrical curved end surfaces equidistant from the center so that the length is greater than the breadth

solid having the shape of an egg

solid having flattened symmetrical top and bottom curved surfaces equidistant from the center and longer symmetrical curved end surfaces equidistant from the center so that the length is greater than the breadth