Mental Math Strategies

You are a clever mathematician. Find the answer in the easiest way possible.

	Problems	Possible solutions
1)	371−197 =	371−200+3
2)	$135 - 47 + 53 + 147 =$	$147 - 47 + 135 + 53 =$
3)	$299 + 99 + 36 =$	$299 + 99 + 1 + 1 + 34$
4)	$589 + 288 =$	$600 + 277 =$
5)	$371 - 145 + 248 =$	$248 - 145 + 371$
6)	$71 \times 12 =$	$710 + 142 =$
7)	101×36=	3600+36
8)	16×98=	1600-32
9)	47×5=	470÷2
10)	490÷5=	980÷10
11)	$5 \times 9 \times 125 \times 2 \times 8 =$	$5 \times 2 \times 125 \times 8 \times 9 =$
12)	$32 \times 125 \times 11 =$	$4 \times 8 \times 125 \times 11 = 8 \times 125 \times 4 \times 11$

Missing digit puzzles

Someone spilled ink on the number sentences below, covering the digits.
Figure out what digits might have been covered.
Remember, each ink spot covers just <u>one</u> digit, and the digits <u>may be different</u>.
Think about how many solutions are possible and fill out the table.

	Problem	How many solutions?		
		None	One	More than one
1	⬡ + ⬡ + ⬡ = 27			
2	⬡ + ⬡ + ⬡ = 17			
3	⬡ + ⬡ + ⬡ = 18			
4	⬡ + ⬡ + ⬡ = 28			
5	1⬡ + 1⬡ + 1⬡ = 57			

Get a Clue !

Fill in the squares with numbers from the magnifying glass. Use each number once in each problem.

Put one number in each box, so that:

- The sum is between 300 and 400.
- There is a 9 in the tens place in the sum.

What is the sum? _____

```
   ☐ 4 ☐
 +
   ☐ ☐ ☐
   ─────
   __ __ __
```

4 3 5 2 1

Engineering drawings and projections

For each of the 4 structures, please find the matching three-view-drawing.
Write the corresponding letter in the space provided.

b, —

f, —

e, —

c, —
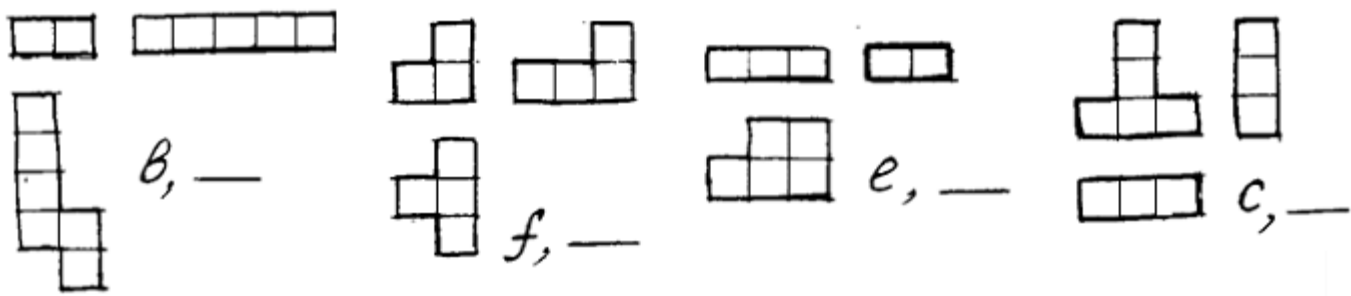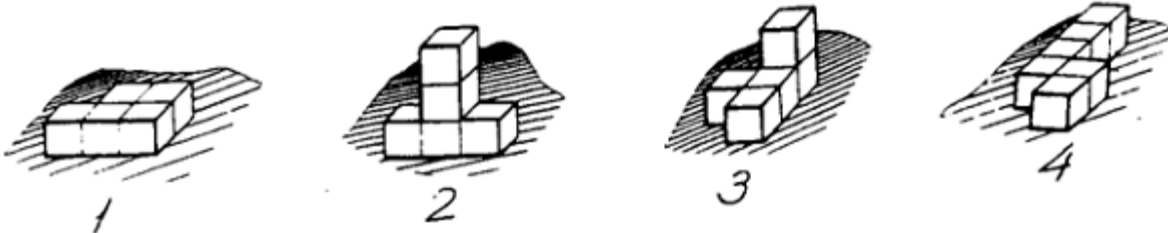
Different Views of a City (2)

This map shows the top view of a cube city.
The eight buildings shown are made from interlocking cubes. The number on each building tells how many cubes high that building is.

A photographer flew around the city in a helicopter.
He took photographs from points A, B, C, and D (looking in the directions of the arrows).
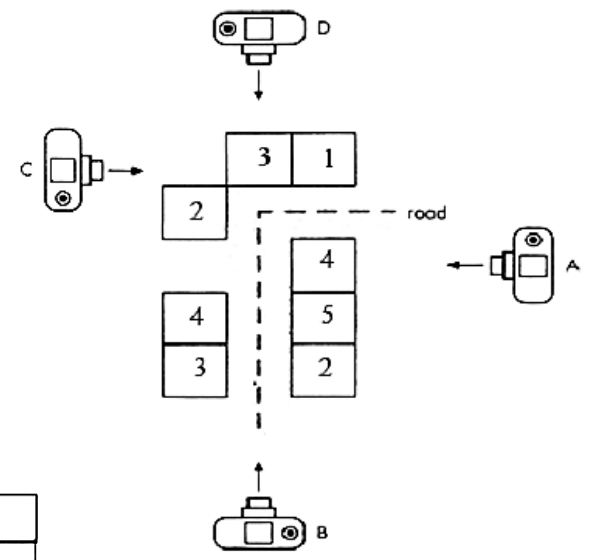
Below each one, write the letter of the point (A, B, C, or D) where it was taken.
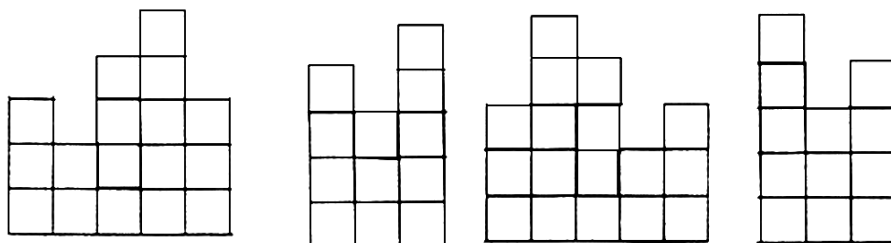
1. ___

2. ___

3. ___

4. ___

Dissections
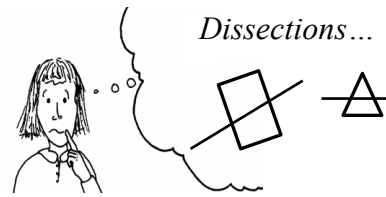
Dissections…

Dissection of a quadrilateral

You can cut (dissect) a shape with one straight line in different ways.

Look at EXAMPLE 1.
This triangle is cut into two triangles
(shapes with 3 and 3 sides).
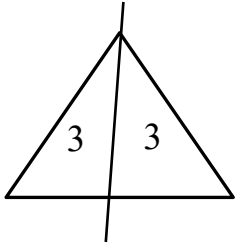
Look at EXAMPLE 2.
This triangle is cut into a triangle and
a quadrilateral*(shapes with 3 and 4 sides)*.
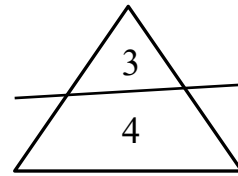
Think about all the ways you can dissect a quadrilateral using one line. Is it possible to get two polygons with 3 sides each? 3 and 4 sides?
Fill in the table by drawing possible configurations. **_All_** the problems here have a solution!

Sides: 3 and 3	Sides: 4 and 4	Sides: 3 and 5

Divide each figure into 4 congruent parts.
The lines of division can only be drawn on the lines of the graph
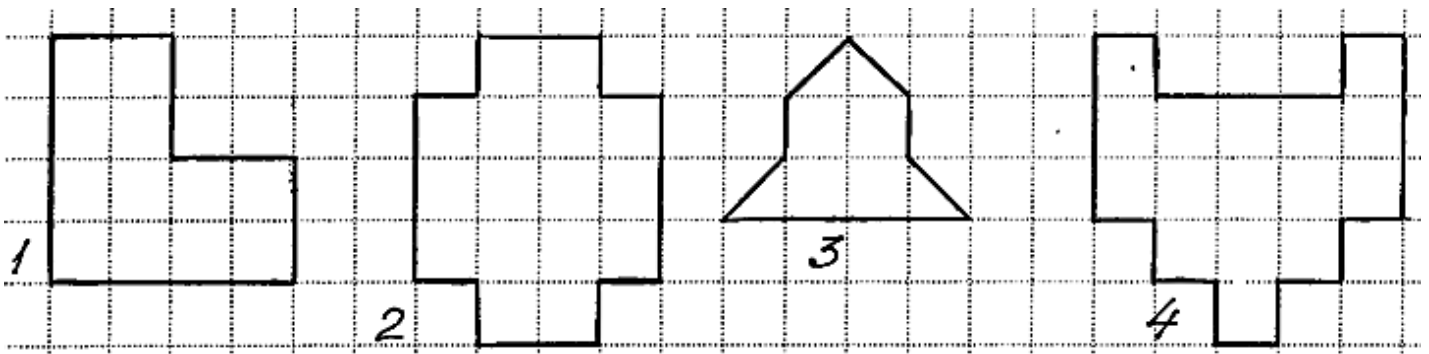
Paper folding and cutting
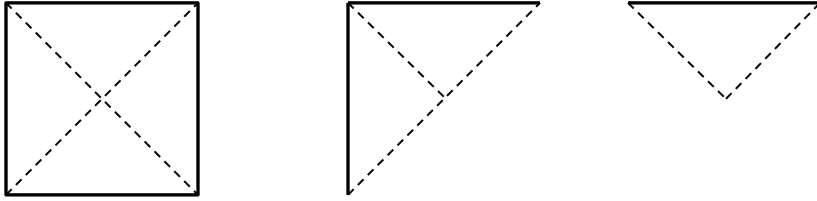
These square sheets of paper are folded in half twice along the dotted lines to form a triangle in a way shown above.

1. If the original squares had the holes in them, draw how they will look like when folded.

a)

c)
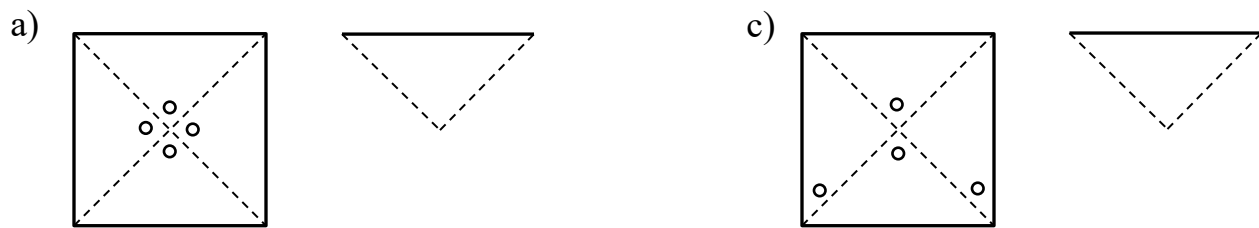
FOLD, CUT, AND PUNCH #1
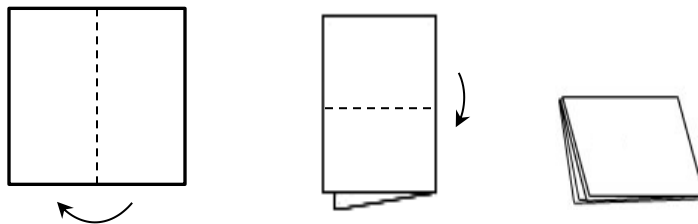
Take a square sheet of paper and fold it in half twice along the dotted lines in a way shown above. Then punch out a design.

What will it look like when unfolded? For example,
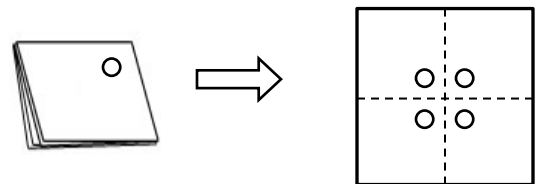
1. The sheets of paper below have been folded then had a design punched out.

   Figure out what they will look like when unfolded and draw the design.

a)

b)

Unicursal Tracing

To trace unicursally means to trace without lifting your pencil or going over a line more than once.
Please trace the following figures unicursally
Please also label the point where you start tracing (label it 1)
and the point where you end (label 2).

a)
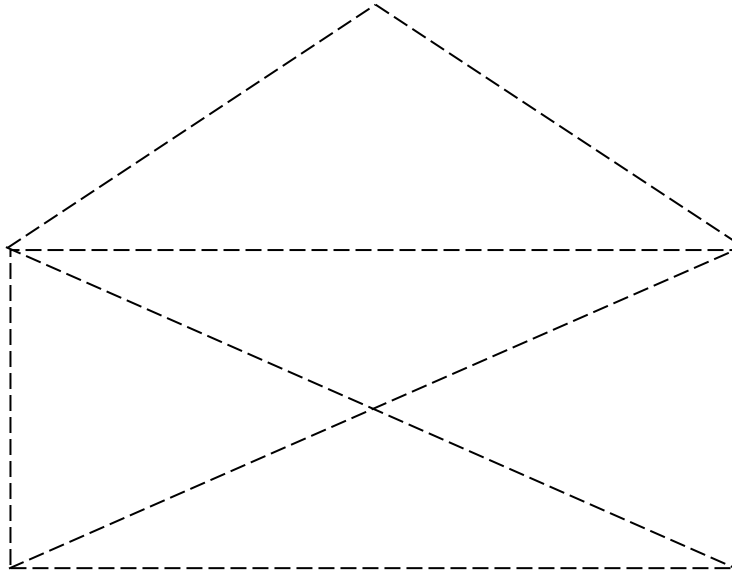
b)
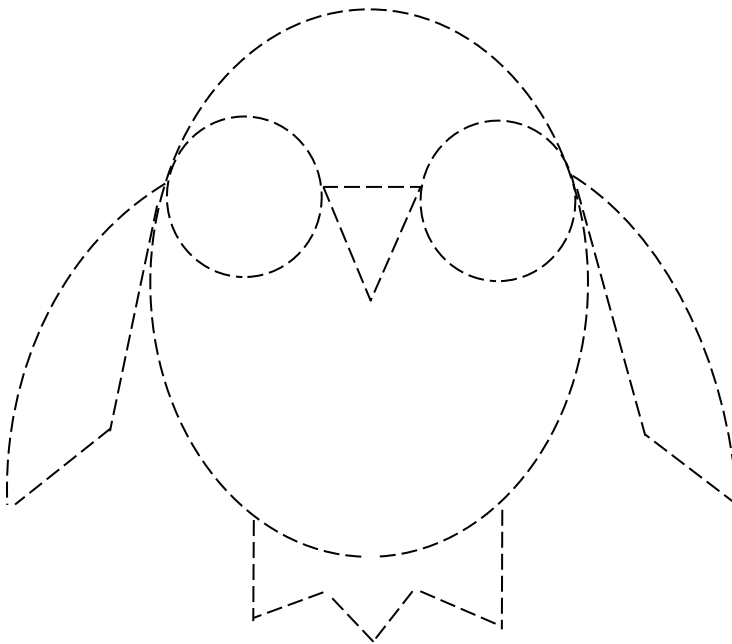
Logic grids

Animal Classroom #2

The animal classroom teacher asked the animals about their favorite numbers.
Each animal named a different number greater than 0 and less than 10.
Use the clues to figure out each animal's favorite number.

Clue 1: The elephant, pig and alligator chose even numbers.

Clue 2: The rabbit, cat and dog chose odd numbers.
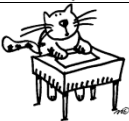
Clue 3: The pig's number is less than 4.

Clue 4: The alligator's number is greater than 6.

Clue 5: The cat's number is half of the elephant's number.

Clue 6: The rabbit's number is 3 times the cat's number.

Clue 7: The dog's number is the sum of the cat's and pig's numbers.

	1	2	3	4	5	6	7	8	9
(rabbit)									
(elephant)									
(cat)									
(pig)									
(dog)									
(alligator)									

Which numbers did not get chosen? _____

VENN DIAGRAMS

Solve the following problem using a Venn diagram.
Fill-in the Venn diagram with the information given.
Fill in all the missing information, and answer the question.

In a pet store, Anna saw lots of different dogs.
   13 of them had long ears,
   19 had short tails,
   11 of the dogs had both long ears and short tails,
   and 24 of the dogs had neither long ears nor short tails.

How many dogs did she see?   _____

_____ dogs

_____

_____ long ears   _____ short tails

____   ____   ____
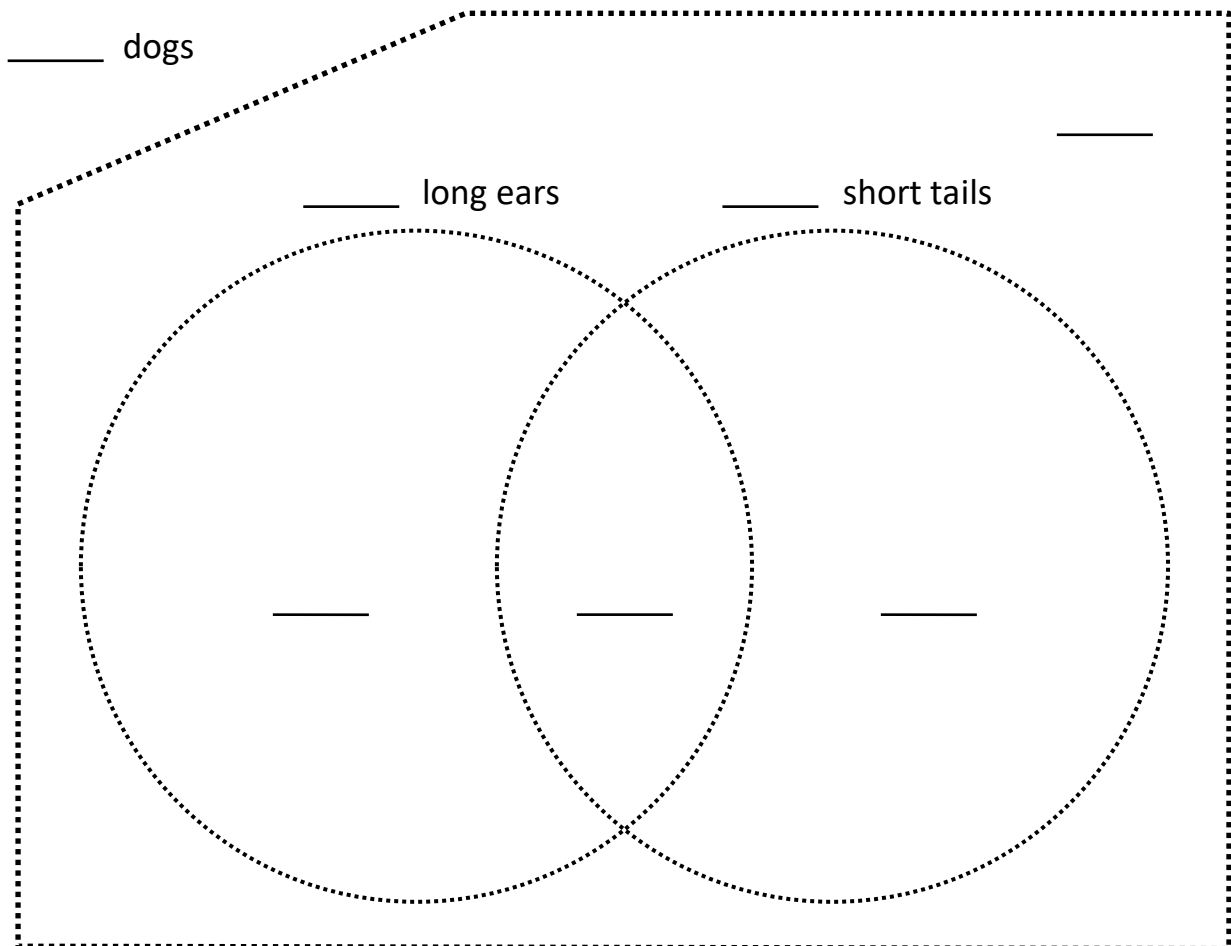
Modeling problems on a number line

Sometimes, drawing a picture or a diagram can help you solve the problem.

Example:

Tom lives closer to the park than Matt. Cindy lives in between Tom and Matt. Anna lives closer to the park than Tom. In what order do the friends live from the park?
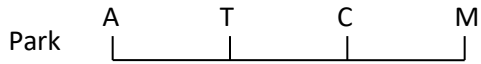
```
              A       T       C       M
    Park      |_____|_____|_____|
```
Answer: *Anna, Tom, Cindy, Matt*

1) On Thursday, Mila has four classes on her schedule. Math class is later in the day than science class. Art is between math and history. History is right after science. What is the order of classes in Mila's schedule on Thursday?

Please, solve these problems about Age

1) In 6 years Paul will be 6 years younger than George is now. Who is younger? _____

   ⊢──────────────────────────────────⊣ *Age*

2) In 10 years Anna will be 8 years younger than Elli is now. Who is older? _____

   ⊢──────────────────────────────────⊣ *Age*
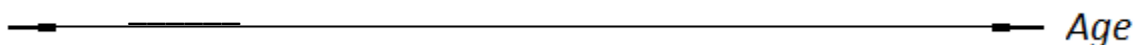
Relations and ordering

1. The arrows show the relations "You are an example of me"
   Think of the words that could satisfy this relation.
   Put these words into the diagram.

```
┌──────────────┐         ┌──────────────┐                  ┌──────────────┐
│ 4.           │────────▶│ 5. Child     │                  │ 1.           │
│              │         │              │                  │              │
└──────────────┘         └──────────────┘                  └──────────────┘
        │    ╲                  ╲      ╲                      ╱
        │     ╲                  ╲      ╲                    ╱
        ▼      ▼                  ▼      ▼                  ▼
┌──────────────┐         ┌──────────────────┐
│ 3.           │◀────────│ 2. Third grader  │
│              │         │                  │
└──────────────┘         └──────────────────┘
```
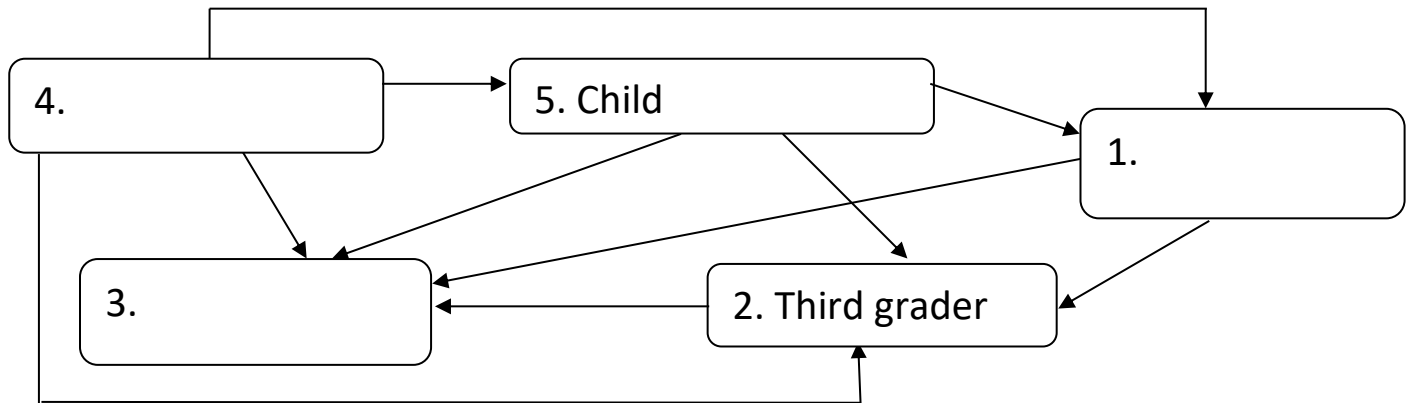
Relationship Match (2)

In this table there are shown 6 examples of 6 different relationships.

Example	Relationship between terms	# of relatioship
Core - apple	part and whole	1
Square - rectangle	a special case and a general case	2
Difficult - hard	synonyms	3
Above- below	antonyms	4
Not preparing for a test - F grade	cause and effect	5
Breakfast - dinner	before and after	6

Write the # of the Relationship

Relation	# of relationship	Relation	# of relationship
1. subtract - take away from		9. triangle - polygon	
2. stem - flower		10. striking a match - fire	
3. yogurt – dairy product		11. child - adult	

Nonverbal reasoning: analogies, patterns, grouping and classification of objects

Which is the odd one out? Write the letter.

1)

a   b   c   d   e

Which picture comes next? Write the letter.

1)

a   b   c   d   e
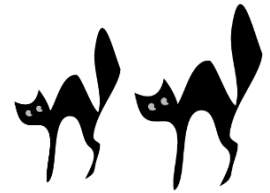
Complete the 3x3 logic table and write the number of correct answer

1   2

3   4

5   6

7   8

More difficult logic problems: pigeonhole principle, fencepost error, jug problems, crossing the river problems

Worst case scenario   MARBLES

Today, Simon is the *unluckiest person* in the whole world!
His friend Leo wants to test just how unlucky he is.

1) The boys put **4 red** marbles, **5 blue** marbles, and **6 yellow** marbles into a bag.

   Leo blindfolds Simon and asks him to take out the marbles from the bag, one by one.

   How many marbles should unlucky Simon take out of the bag to be *completely* sure that he has…

1.	2 marbles of the same color?
2.	2 blue marbles?
3.	2 blue and 2 red marbles?
4.	3 marbles of the same color?
5.	more red than blue marbles?

Jugs   **Problem 1**

Tim is at the beach and is building a sand castle. He needs exactly 3 gallons of sand.
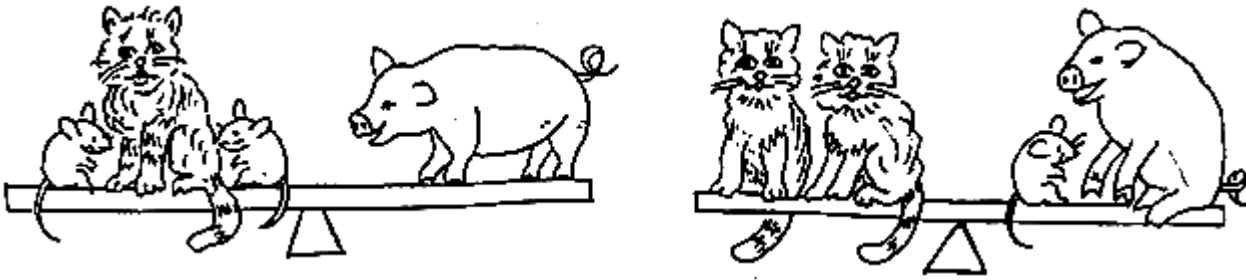
Using only a 4-gallon bucket and a 9-gallon bucket,

how can Tim get the exact amount of sand that he needs?

Write your solution in the chart. Try to decrease the number of rows.

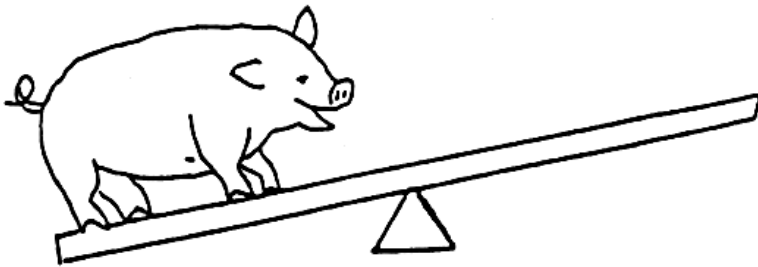|	4-gallon container	9-gallon container
Before	0	0
1		
2		
3		
4		
5		
6		
7		

Balance puzzles (introduction to equations)
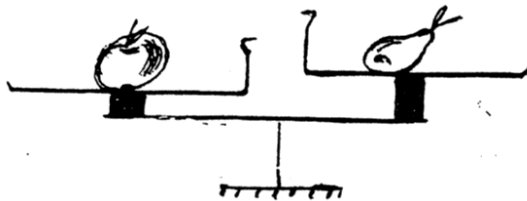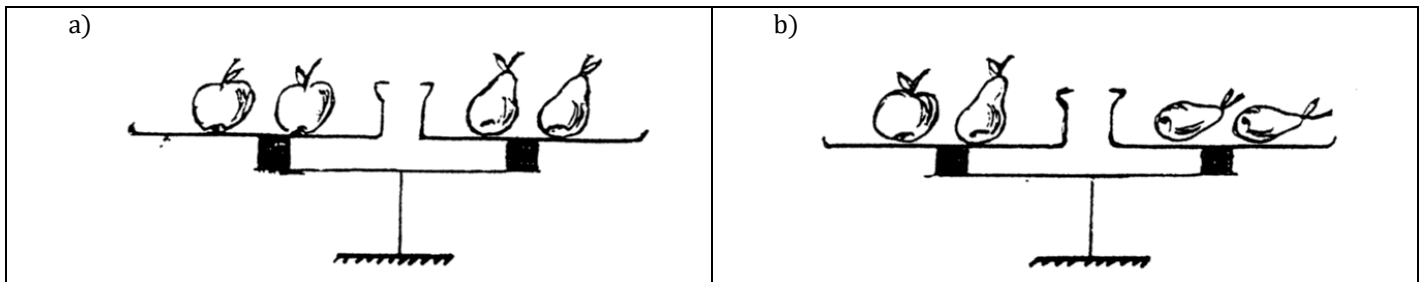
1) These scales are balanced.

How many mice do you need to balance this scale?

2) Given:

Draw in arrows (↓↑) to compare the weight if possible:

a)	b)

Number codes (introduction to systems of equations)

Each shape stands for a different number.
Can you break the code? Write the numbers inside the shapes.

$$\bigcirc + \triangle - 10 = 12$$

$$\triangle + \bigcirc + \bigcirc = 31$$

Fill in the shapes with numbers from the bubble.
Same shapes have the same numbers. Different shapes have different numbers.
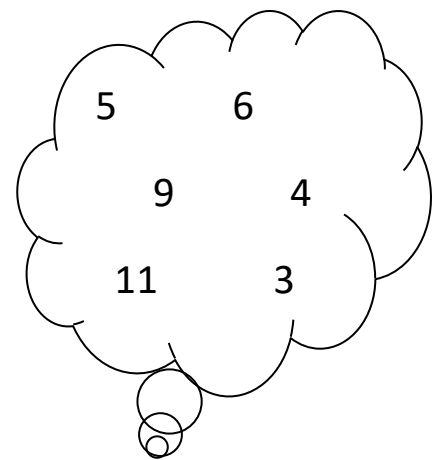
A. $3 \times \square = \triangle + \square$

B. $\square + \text{▱} = 4 \times 3$

C. $\text{▱} - 8 = 5 \div 5$

D. $\pentagon + \triangle = \hexagon$

E. $\bigcirc + \bigcirc + \bigcirc = \triangle + \triangle$

5   6

9   4

11   3

Investigation problems

Window view

Four kids -- Nina, Ella, Sam and Willy -- live in a house with 4 windows.
The house is in the middle of a garden.
Their garden has 8 square flower beds numbered from 1 to 8.
From their windows, each kid has a view of the three neighboring flower beds.

16 flowers are planted in the garden.
Fill in the number of flowers growing in each square in the picture to the right if:

<u>each child can see exactly 6 flowers</u>.

1	2	3
8 Willy	Nina Ella Sam	4
7	6	5

Tower Of Hanoi

The puzzle starts with the disks stacked in order of size (largest to smallest) on one rod.
The objective of the puzzle is to move the entire stack to another rod, following these rules:

- Only one disk can be moved at a time.
- Each turn, you can take the upper disk from one of the stacks and place it on top of another stack or on an empty rod.
- No larger disk may be placed on top of a smaller disk.

Problem 3:
Start with 3 disks on rod A and rods B and C empty. Transfer the whole stack on rod B as shown.
Write down your steps in the table below.