

MK 1

1. What number do we need to place inside to make $12 \times 12 \times 12 = 6 \times \underline{\quad} \times 6$ true?
 a. 12 b. 24 **c. 48** d. 72 e. 60

$$12 \times 12 \times 12 = 6 \times 2 \times 6 \times 2 \times 6 \times 2 = 6 \times 6 \times \underbrace{(2 \times 2 \times 2 \times 6)}_{48}$$

2. Chynna baked some cookies. She tried to divide them evenly first between 2 plates, then between 3 plates, and finally between 4 plates. Each time she had one cookie left over. How many cookies did Chynna bake?
 a. 9 b. 10 c. 11 d. 12 **e. 13**

$$\begin{array}{l} 2x+1 \\ 3y+1 \\ 4z+1 \end{array} \} 12c+1 \rightarrow 13$$

3. On Monday morning, a snail fell down a well which is 5 meters deep. During the day, it climbs up 2 meters, and during the night it slides down 1 meter. On what day of the week will the snail get out of the well?
 a. Tuesday b. Wednesday **c. Thursday** d. Friday e. Monday

Day	M	T	W	Th
afternoon	3	2	1	0
night	4	3	2	

4. There were 31 runners competing in a race. The number of runners who finished before Vi is four times smaller than the number of runners who finished later than Vi. At what place did John finish?
 a. 6 **b. 7** c. 8 d. 20 e. 21

$$\begin{array}{c} \text{---} x \text{---} \text{Vi} \text{---} \text{---} \frac{4x}{\text{---}} \text{---} \\ x + 4x + 1 = 31 \\ 5x = 30 \\ x = 6 \end{array} \quad \text{So Vi is at } 6+1 = 7^{\text{th}}$$

5. Half a loaf of bread costs 6 pence more than one-fourth of a loaf of bread. How many pence does a whole loaf of bread cost? (Note: A pence is an English coin)
 a. 6 b. 12 c. 18 **d. 24** e. 30

$$\begin{array}{l} 6 = \frac{1}{4} \text{ cost} \\ 24 = \text{cost} \end{array}$$

MK 2

1. There are 15 balls in a box: white, red, and black balls. The number of white balls is 7 times greater than the number of red balls. How many black balls are there in the box?

- a. 1 b. 3 c. 5 **d. 7** e. 9

$w = 7r$ if $r=1, w=7, b=15-7-1=7$
 if $r=2: w=14, b=15-14-2=-1 \times$
 so $r=1, w=7, b=7$

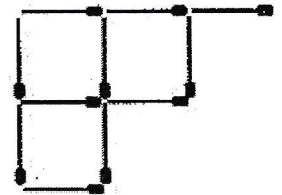
2. Paul was going to buy 4 servings of ice cream, but he was 80 cents short. So, he bought 3 servings and had 30 cents left. What was the price of one serving of ice cream?

- a. 70 cents b. 80 cents c. 90 cents d. 1 dollar **e. 1 dollar and 10 cents**

let $m = \text{how much money Paul has}$
 $4 \text{ cost} = m + 0.80$
 $3 \text{ cost} = m - 0.30$
 $\text{cost} = 1.10$

3. We are making a square "chessboard" using matches that are 5 centimeters long. One side of the chessboard will be 1 meter long. The pic shows the upper left-hand corner of the board. How many matches will we use?

- a. 400 b. 480 c. 640 **d. 840** e. 960



$20 \times 21 \times 2 = 840$

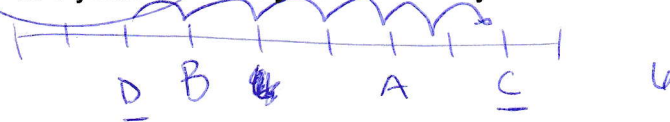
4. How many three-digit numbers are there that have the sum of their digits equal to 5? (For example, 122 is such a number, because $1 + 2 + 2 = 5$.)

- a. 10 **b. 15** c. 20 d. 25 e. 30

500×1
 410×4
 320×4
 311×3
 221×3
 Total: 15

5. Ania is 3 years older than Basia and 2 years younger than Celina. Dorota is 1 year younger than Basia. How much older is Celina than Dorota?

- a. 5 years **b. 6 years** c. 4 years d. 2 years e. They are the same age



6. In a certain soccer tournament, the winning team gets 3 points, the losing team gets 0 points, and the case of a tie, both teams get 1 point each. My team played 31 games and received 64 points. 7 of the games were ties. How many games did my team lose?

- a. 0 **b. 5** c. 19 d. 21 e. 24

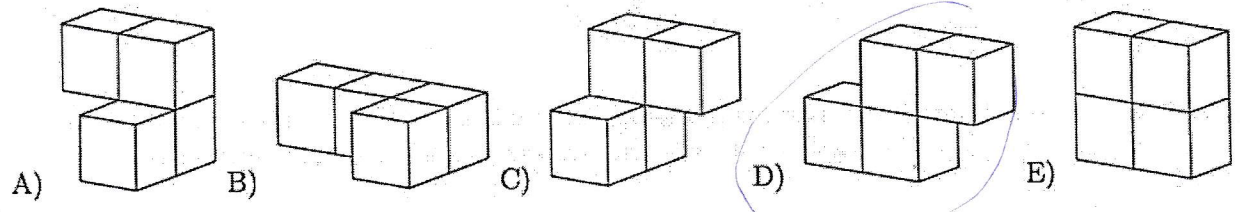
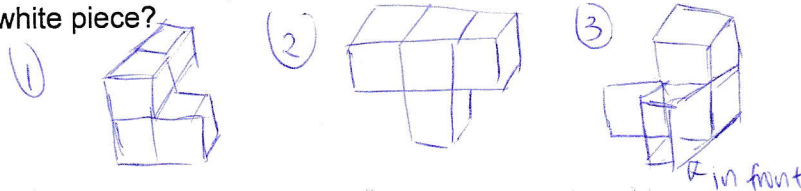
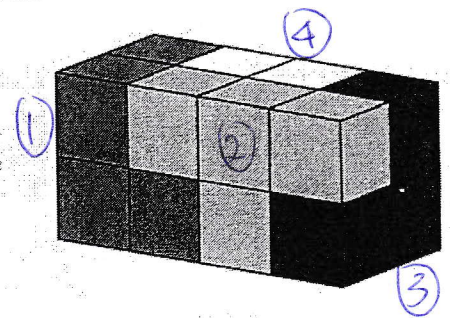
$31 \text{ games} \quad 64 \text{ points}$
 $- 7 \text{ ties} \quad 7 \text{ points}$

 $24 \text{ games left, } 57 \text{ points left}$

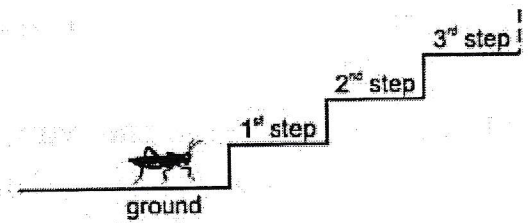
$\# \text{ wins} = \frac{57 \text{ points}}{3 \text{ points/win}}$
 $= 19 \text{ wins}$
 $\text{losses} = 24 - 19 = 5 \text{ losses}$

MK 3

1. A rectangular prism is made of four pieces, as shown. Each piece consists of four cubes and is a single color. What is the shape of the white piece?



2. A grasshopper wants to climb a staircase with many steps. She makes only two kinds of jumps: 3 steps up or 4 steps down. Beginning at the ground level, at least how many jumps will she have to make in order to take a rest on the 22th step?
 a. 7 b. 9 c. 10 **d. 12** e. 15



want going up steps divisible by 3: $22 + 4 + 4 = 30$
 go up 30 steps, go down 8 steps = 22th step
 10 jumps + 2 jumps = 12 jumps

3. Ashin forms two numbers with the digits 1, 2, 3, 4, 5, and 6. Both numbers have three digits, and each digit is used only once. He adds these two numbers. What is the greatest sum Ashin can get?
 a. 975 b. 999 c. 1083 **d. 1173** e. 1221

$$\begin{array}{r} 642 \\ + 531 \\ \hline 1173 \end{array}$$

(choose hundreds with 6 & 5,
 tens with 4 & 3,
 ones with 2 & 1)

4. Doug chose a positive number, multiplied it by itself, added 1, multiplied the result by 10, added 3, and multiplied the result by 4. His final answer was 2012. What number did Doug choose?
 a. 11 b. 9 c. 8 **d. 7** e. 5

go back-wards! $\sqrt{\left(\left(\left(2012 \div 4\right) - 3\right) \div 10\right) - 1}$
 ① $\frac{2012}{4} = 503$ ④ $50 - 1 = 49$
 ② $503 - 3 = 500$ ⑤ $\sqrt{49} = 7$
 ③ $500 \div 10 = 50$

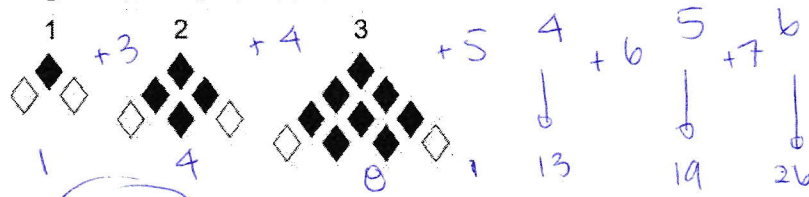
5. A rectangular paper sheet measures 192 x 84 mm. You cut the sheet along just one straight line to get two parts, one of which is a square. Then you do the same with the non-square part of the sheet, and so on. What is the length of the side of the smallest square you can get with this procedure?
 a. 1 mm b. 4 mm c. 6 mm d. 10 mm **e. 12 mm**

$192 \times 84 \rightarrow 108 \times 84 \rightarrow 24 \times 84 \rightarrow 24 \times 60 \rightarrow 24 \times 36 \rightarrow 24 \times 12$
 $192 - 84 = 108$ $108 - 84$ $84 - 24$ $60 - 24$ $36 - 24$
 $\rightarrow 12 \times 12$
 $24 - 12$

MK 4

1.

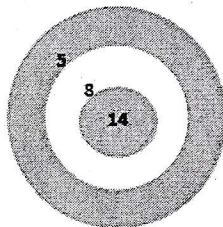
The first three stages of a pattern are shown in the picture. How many black diamonds does the figure in stage 6 have?



- (A) 19 (B) 21 (C) 26 (D) 28 (E) 34

2.

Ann threw seven darts at the dartboard, shown in the figure, and scored 32 points in total. How many darts did not hit the dartboard?



How to score 32?

$$8 + 8 + 8 + 8 = 32$$

4 hits

$$7 - 4 = 3 \text{ misses}$$

- (A) 2 (B) 3 (C) 4 (D) 5 (E) 6

3.

A soccer coach is selecting a team amongst players who are from 20 to 35 years old. At least how many players should be selected for the team so that, for certain, two players are of the same age?

- (A) 14 (B) 15 (C) 16 (D) 17 (E) 20

20 → 35 years includes 16 people

- to select one age with two people: +1

> 17

4.

Four workers are building a house. In five days they built half the house. But winter is coming and they want to finish building the house in two more days. How many friends should the workers call for help, if they do not want to bother more people than is necessary?

- (A) 2 (B) 4 (C) 6 (D) 7 (E) 10

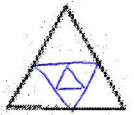
$$5 \times 4 = (4 + w) \times 2$$

$$10 = 4 + w$$

$$w = 6$$

MK #5

1. Joining the midpoints of the sides of the triangle in the drawing, we obtain a smaller triangle. We repeat this one more time with the smaller triangle. How many triangles of the same size as the smallest resulting triangle fit in the original drawing?



- a. 5 b. 8 c. 10 **d. 16** e. 32

$4 \times 4 = 16$

2. After the First of January 2013, how many years will pass before the following event happens for the first time: the product of the digits in the notation of the year is greater than the sum of these digits?

- a. 87 b. 98 c. 101 **d. 102** e. 103

first step: no zeros

$$\begin{array}{r} 2013 + 87 = 2100 \\ 2100 + 11 = 2111 \\ \hline 98 \end{array}$$

check 2111
 $2 \times 1 \times 1 \times 1 = 2$
 $2 + 1 + 1 + 1 = 5$
 (+98 yrs)

2114:
 $2 \times 1 \times 1 \times 4 = 8$
 $2 + 1 + 1 + 4 = 8$
 (+101)

2115
 $2 \times 1 \times 1 \times 5 = 10$
 $2 + 1 + 1 + 5 = 9$
 (+102) ✓

3. In December, Tosha-the-cat slept for exactly 3 weeks. How many minutes did he stay awake during this month?

- a. $(31-7) \times 3 \times 24 \times 60$ **b. $(31-7 \times 3) \times 24 \times 60$** c. $(30-7 \times 3) \times 24 \times 60$ d. $(31-7) \times 24 \times 60$ e. $(31-7 \times 3) \times 24 \times 60 \times 60$

4. Cassandra has to sell 10 glass bells which vary in price: \$1, \$2, \$3, \$4, \$5, \$6, \$7, \$8, \$9, and \$10. In how many ways can Cassandra divide all the glass bells into three packages so that each package has the same price?

- a. 1 b. 2 c. 3 d. 4 **e. Such a division isn't possible**

$1 + 2 + \dots + 10 = 55 \dots$ not divisible by 3!

5. Doug wrote down several numbers using only the digits 0 and 1. The sum of these numbers is 2013. It turned out that it is impossible to get the same sum by adding up fewer numbers of this kind. How many words did Doug write?

- a. 2 **b. 3** c. 4 d. 5 e. 204

$2013 = 1011 + 1001 + 1$
 (highest digit!)