13. There were 31 runners competing in a race. The number of runners who finished before John is four times smaller than the number of runners who finished later than John. At what place did John finish?

x = number of runners who finished before John

$x + 4x = 30$

$5x = 30$

$x = 6$

A) 6 B) 7 C) 8 D) 20 E) 21

14. 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.)

x = cost of ½ a loaf

$x = \frac{1}{2}x + 6$

$\frac{1}{2}x = 6$

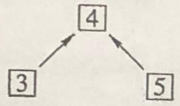
$x = 12$

cost of whole loaf = $2x = 24$

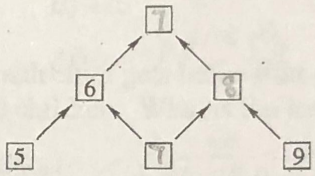
A) 6 B) 12 C) 18 D) 24 E) 30

Problems 5 points each:

15. Write numbers into the blank boxes in the pyramid to the right according to the pattern shown below.



$4 = \frac{3+5}{2}$



What number is on top of the pyramid?

A) 5 B) 7 C) 8 D) 9 E) 12

16. There are 15 balls in a box: white balls, red balls 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?

w = white, r = red, b = black

$w = 7r$ → r must be 1 since 2 red balls would mean there are 14 white balls, which would be 16 total balls

$w + r + b = 15$

$7 + 1 + b = 15$ $b = 7$

A) 1 B) 3 C) 5 D) 7 E) 9

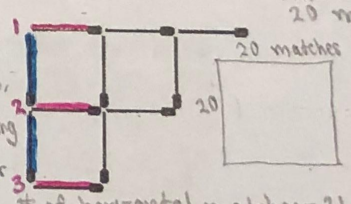
17. Paul was going to buy 4 servings of ice cream, but he was 80 cents short. So, he bought 3 servings and had 30 cents left. What was the price of one serving of ice cream?

$30 + 80 = 110$

A) 70 cents B) 80 cents C) 90 cents D) 1 dollar E) 1 dollar and 10 cents

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

1 m = 100 cm = 20 matches



2 rows, but 3 including the border

* use 21 because you have to include the row that makes up the border

# of horizontal matches = 21 rows × 20 = 420

# of vertical matches = 21 columns × 20 = 420

A) 400 B) 480 C) 640 D) 840 E) 960

19. 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.)

122 410 401
212 140 302
221 104 203
500 113
320 131
230 311

A) 10 B) 15 C) 20 D) 25 E) 30

MATH KANGAROO in USA 1998 Level 3 – 4

Dorota (+1) Basia (+3) Ania (+2) Celina

20. 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.

21. In a certain soccer tournament, the winning team gets 3 points, the losing team gets 0 points, and in 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 - 7 = 24 games weren't ties

64 - 7 = 57 points from winning games

$\frac{57}{3} = 19$ wins

24 - 19 = 5 losses

15. Each of the kangaroo's eleven children has eleven children, and each of them also has eleven children. How many great-grandchildren does the kangaroo have?

$11^3 = 1{,}331$

121 × 11 = 1121 + 210 = 1,331

A) 111 B) 121 C) 11211 (D) 1331 E) 12321

16. What is the least possible number of children in the Kowalski family if each of the children has at least one brother and at least one sister?

There has to be 2 girls and 2 boys for each girl to have at least 1 sister and each boy to have at least 1 brother.

A) 1 B) 2 C) 3 (D) 4 E) 5

Problems 5 points each:

17. Peter opened a book and found that the sum of the page number on the left and the page number on the right is equal to 21. What is the product of the two page numbers?

Two consecutive numbers that add up to 21: 10 and 11 → $11 \times 10 = 110$

A) 121 B) 100 C) 420 (D) 110 E) 426

18. Father Virgil is taking care of 143 children. Each day, each child gets half a liter of milk with breakfast. The milk from one cow is enough for 40 children. What is the least number of cows that Father Virgil needs to have?

$\frac{1 \text{ cow}}{40 \text{ kids}} = \frac{x \text{ cows}}{143 \text{ kids}}$

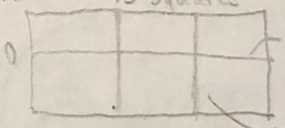
$40 \overline{)143}$: 3, −120, 23

There's a remainder; 3 cows aren't enough

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

19. A kangaroo wants to make a rectangular bedspread 1.5 m long and 1 m wide using square scraps which measure 10 cm × 10 cm. At every point where four squares meet she wants to place a fancy button. How many buttons will she need?

ignore border



13 × 8

A) 150 (B) 104 C) 126 D) 140 E) 135

20. Pinocchio's wooden nose is 3 cm long. Whenever Pinocchio lies, the length of his nose doubles. How long will his nose be after he tells 6 lies?

$3 \times 2^6 = 3 \times 64 = 192$

(A) 192 cm B) 67 cm C) 96 cm D) 18 cm E) 384 cm

21. In the yard there is an equal number of pigs, ducks and chickens. Together, they have 144 legs. How many ducks are there in the yard?

4 legs, 2, 2

$4p + 2d + 2c = 144$

$p = d = c$

$4d + 2d + 2d = 144$

$8d = 144$

$d = 18$

(A) 18 B) 21 C) 35 D) 42 E) 43

22. One number was chosen from the numbers 51, 52, 53, 54 and 55, and the digit 0 was placed between the digits of that number. What is the difference between the new number and the number which was chosen?

501 − 51
502 − 52
503 − 53
504 − 54
505 − 55
} = 450

A) 500 B) 50 C) 550 (D) 450
E) The difference depends on which number was chosen.

1 grandkid gets 0 candy

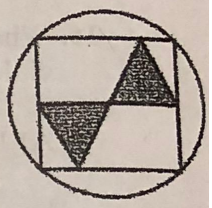
23. If Grandma gave each of her grandchildren 10 pieces of candy, there would not be enough candy for one of the grandchildren. If she gave each one of them 8 pieces of candy, she would have 6 pieces of candy left. How many grandchildren does she have?

$8x+6 = 10x-10$ ← short by 10 candies for the last grandkid

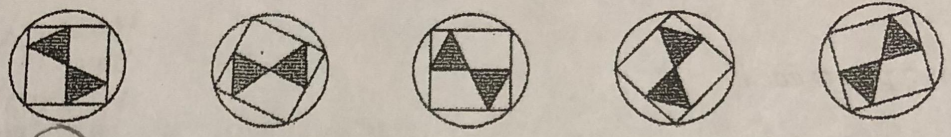
$2x = 16$

$x = 8$

A) 4 B) 6 (C) 8 D) 10 E) 12



24. The figure shown rotates clockwise and makes one full rotation in one hour. At 12:00 it is as shown in the picture to the right. What will it look like at 2:15?



(A) B) C) D) E)

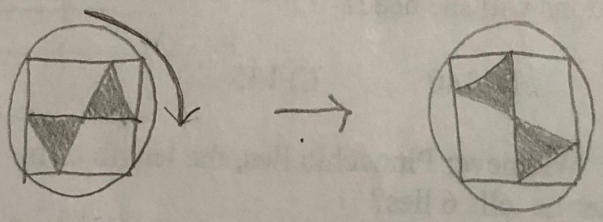
12:00 → 2:15

Change of 2 hours and 15 mins.

↑ ignore hours since they're full rotations and don't change the figure's orientation

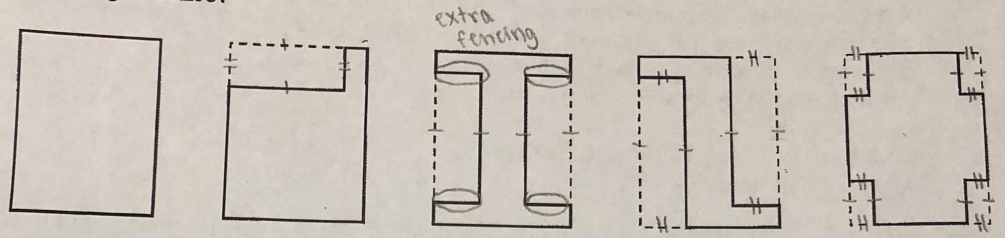
15 mins = $\frac{1}{4}$ of an hour = $\frac{1}{4} \times 360°$ in a full rotation = 90°

Figure should be rotated 90° clockwise.



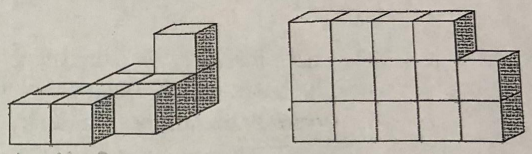
* Note: It may help to flip the paper 90° clockwise and look at the original figure. Also, notice that the original figure has a horizontal line through the middle, so a 90° clockwise rotation should result in a figure with a vertical line through the middle.

15. Each of five neighbors owns a rectangular plot of land with the same area. The parts of the land with flowers growing on them are fenced in (solid line in the pictures). Who has the longest fence?



A) Mr. Adam B) Mr. John C) Mr. Jack D) Mr. Peter E) Mr. Mark

16. For his birthday Patrick got a box with some identical cube blocks. He used all of them to make two projects (see the picture). All the blocks together weigh 900 grams. The project on the left weighs 300 grams and the picture shows all the blocks it is made of. How many blocks in the figure on the right are not shown?



10 cubes / 300 g ; $\frac{300}{10} = 30$ g/cube

must be 600 g since both projects have to equal 900 g

A) 4 B) 5 C) 6 D) 7 E) 8

14 cubes shown = $14 \times 30 = 420$ g

weight of cubes not shown = $600 - 420 = 180$

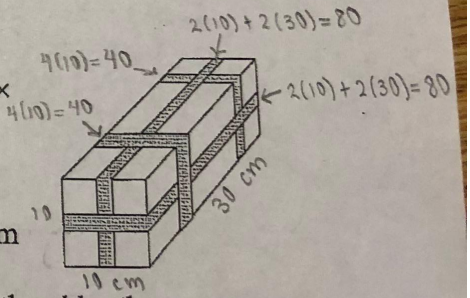
$180 \div 30 = 6$ cubes not shown

Problems 5 points each:

17. Altogether, 6 hens eat 8 cups of grain in 3 days. How many cups of grain will 3 hens eat in 9 days? 3 hens eat 4 cups in 3 days $4 \times 3 = 12$ 3 hens eat 12 cups in 9 days

A) 10 B) 12 C) 14 D) 16 E) 9

18. Ania's birthday present is placed in a box with dimensions of 10 cm × 10 cm × 30 cm and wrapped with a ribbon as shown in the picture. What is the length of the ribbon?



A) 2 m B) 240 cm C) 260 cm D) 3 m E) 250 cm

19. Three kangaroos were born consecutively every 4 years. Right now the oldest kangaroo is 5 times as old as the youngest one. How old is the youngest kangaroo?

A) 10 B) 8 C) 6 D) 4 E) 2

age of oldest = x

age of youngest = y

$x = 5y$

$y = x - 8$

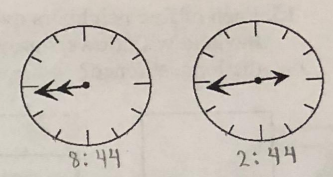
$y = (5y) - 8$

$8 = 4y$

$y = 2$

youngest is born 8 years after the oldest

20. When Marysia was leaving home between 8 and 9 in the morning, she noticed that the hour hand and the minute hand on her watch were overlapping. When she returned home between 2 and 3 in the afternoon the hour hand and the minute hand formed a straight line (see the picture). How long was Marysia away from home?



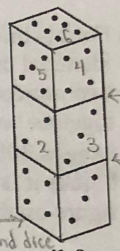
A) 5 hours B) 5 and a half hours (C) 6 hours
D) 6 and a half hours E) 7 hours

$n + \frac{1}{2}n = 2n - 3$
$3 = \frac{1}{2}n$
$n = 6$

21. Find the number which has the following property: If we add this number and half this number, we will get a number which is 3 less than twice the original number.

A) 2 B) 4 (C) 6 D) 8 E) 10

22. Three identical dice are placed one on top of the other (see the picture). The sides which touch each other have the same numbers on them. What is the number on the bottom of the lowest die?



sides touching must be 1

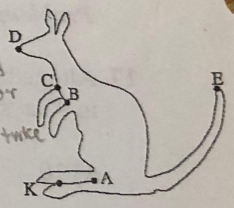
sides touching must be 6 since bottom of 2nd dice is the same as top of 1st dice

must be 1 since bottom of 3rd dice is same as top of 2nd dice

(A) 1 B) 2 C) 3 D) 5 E) 6

If starting at A or K there's no way to draw the arm and the line from B to C without going over the same line twice

23. Pete wanted to draw the picture of a kangaroo shown without lifting his pencil from the paper and without going over the same line twice. At what point should he start (see the picture)? starting at B or C, you'd have to trace from K to A and then from A to K, so it doesn't work



A) A B) B or C D) D or E D) K
(E) There is no such point; this is impossible.

Starting at D or E, you can't draw the arm and the line from B to C or the line from A to K without going over lines twice

24. A magical ball falling to the ground bounces twice as high as the height from which it was dropped. From what height was the ball dropped if it reached the height of 320 cm after the second bounce?

(A) 80 cm B) 160 cm C) 320 cm D) 640 cm E) 1280 cm

$320 = \text{starting height} * 2^2$ ← second bounce
$320 = \text{starting height} * 4$
$\text{starting height} = 80 \text{ cm}$