

SCHOOL: .....

# Eastern Area Mathematical Challenge 2008

## Round 1 (30 marks)

### 15 starters for 30

1. What is 16% of 30% ?

2. What is  $\frac{3}{4} - \frac{3}{5}$  as a fraction?

3. What is  $\frac{5}{16}$  as a decimal ?

4. A computer is marked for sale at “35% off”. If its sale price is £585, what was its original price?

5. Solve  $3x - 11 = 9x + 11$

6. What is the mean of  $\frac{1}{2}$ ,  $\frac{2}{3}$ ,  $\frac{3}{4}$  and  $\frac{5}{6}$  ?

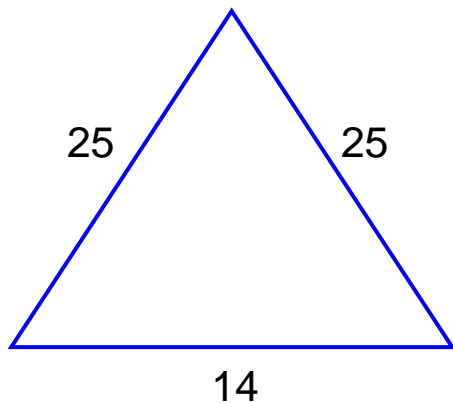
7. Factorise  $x^2 + 2x - 143$ .

8. The mean weight of eight players in a rugby scrum is 85kg. A player of weight 90kg is replaced by a player of weight 84kg and a player of weight 88kg is replaced by a player 78kg, what is the new mean weight of the scrum?

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9. Calculate the number of inches in 22 yards.

10. Find the area of the isosceles triangle.




11. What is the probability of getting a prime total when you throw two fair dice.

12. Write 323 as a product of prime numbers.

13. A train leaves Birmingham at 10.00 am travelling to London at a speed of 50 mph. At the same time a train leaves London travelling to Birmingham at 75 mph. The distance between London and Birmingham is 100 miles. At what time do they pass each other.

14. Make  $t$  the subject of the formula  $p = \frac{q}{r-t}$

15. How many vertices are there on a icosahedron ?

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# Eastern Area Mathematical Challenge 2008

## Round 3 (20 marks)

1. Write 127 as a binary number.

2. Write 10001 as a number in base 10

3. Complete the following number sequence:  
 11, 110, 1001, 1100, ,

4. Calculate  $101 + 1010$  (answer in binary)

5. Calculate  $1101 - 110$  (answer in binary)

6. Calculate  $10011 \times 111$  (answer in binary)

7. Calculate  $101^{(11)}$  (answer in binary)

8. Write one half in binary (not as a fraction!).

9. Solve the following equation in binary:  
 $11x - 101 = 10110$        $x =$

10. Use your understanding of binary and base 10 to add the follow in base 3:

$$12 + 121 = \text{  }$$

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## Eastern Area Mathematical

### Challenge 2008

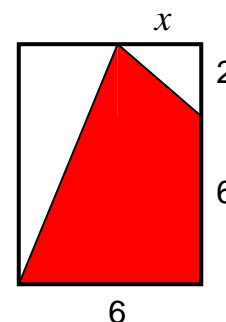
#### Round 2 Multi-Choice (20 marks)

1. A shop advertises 'Buy one, get one at half price'.

*For this offer, the average cost per item is the same as:*

A Two for the price of one    B Three for the price of one    C Three for the price of two

D Four for the price of three    E Five for the price of four



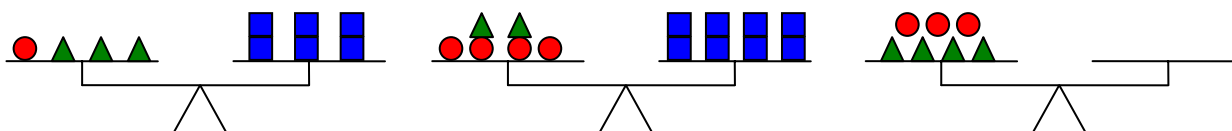
2. Three quarters of the area of the rectangle has been shaded.

*What is the value of  $x$  ?*

A 2    B 2.4    C 3    D 3.6    E 4

3. The first two scales are perfectly balanced.

*How many squares will be needed on the right of the third scales so that the scales balance?*



A 12    B 10    C 9    D 8    E 7

4. Sam can mow a lawn in 1 hour. Mel takes 3 hours to mow the same lawn, and Chris takes 6 hours to do the same.

*If they work with a lawn mower each, and do not get in the way of each other, how long would they take to mow the lawn together?*

A 40 minutes    B 3 hour 20 minutes    C 30 minutes

D 6 minutes    E 10 hours

5. De Bouvelles said that at least one of the numbers  $6n + 1$  or  $6n - 1$  is always prime for any positive integer  $n$ . In fact he was wrong! Find the smallest value of  $n$  for which his claim fails.

A 5    B 8    C 12    D 20    E 24

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# Eastern Area Mathematical Challenge 2007

## Round 4 (48 marks)

*(a) Counting the days ...*

Is it possible to have five Sundays in the same month?

Is it possible for February to have five Sundays ?

Is it possible for July to have six Sundays?

If the 19<sup>th</sup> of a month is a Sunday, what date is the last Monday of the month?

Can there ever be more Wednesdays than Mondays in the same month?

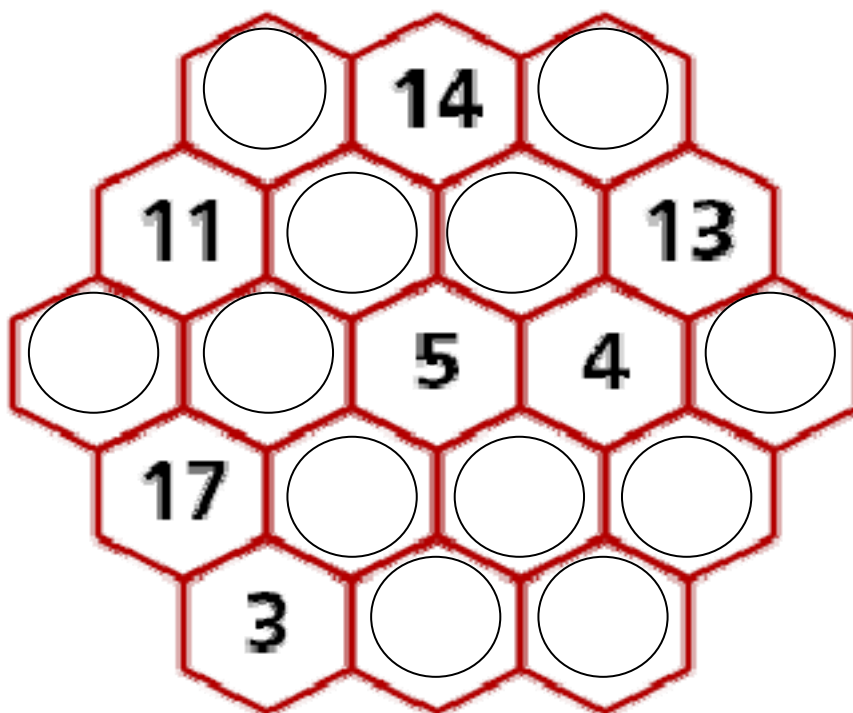
In the past, many people were paid on Fridays. Although there are 52 weeks in a year, could there ever be 53 pay days?

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***(b) Magic hexagon***

When this hexagon is filled with the numbers from 1 to 19, once each, it is possible to obtain a magic total of 38 by adding the numbers in any line.

Fill in the blank hexagons.



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***(c) How many rhombuses?***

How many rhombuses can you find in the 5 by 5 rhombus grid below?

Complete the results table below.



Number of 1 by 1 rhombuses = \_\_\_\_\_

Number of 2 by 2 rhombuses = \_\_\_\_\_

Number of 3 by 3 rhombuses = \_\_\_\_\_

Number of 4 by 4 rhombuses = \_\_\_\_\_

Number of 5 by 5 rhombuses = \_\_\_\_\_

Total number of rhombuses = \_\_\_\_\_

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*(d) Sums and Products?*

Find the set of positive numbers whose sum is 13 and produces the largest answer when their product is calculated.

e.g.  $1 + 6 + 6 = 13$  and so  $1 \times 6 \times 6 = 36$

**Answer:**

The numbers that add up to 13 are

The product of these numbers is

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# Eastern Area Mathematical Challenge 2008

## Round 5 (30 marks)

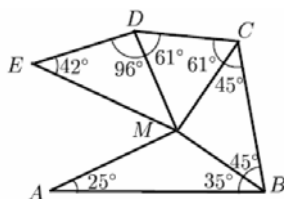
1.

A circle was inscribed into a square with each side equal to 10. A rectangle was inscribed into this circle with one of the sides equal to 8. What percent of the area of the square is the area of the rectangle?

- A. 80%      B. 64%      C. 48%      D. 36%      E. 24%

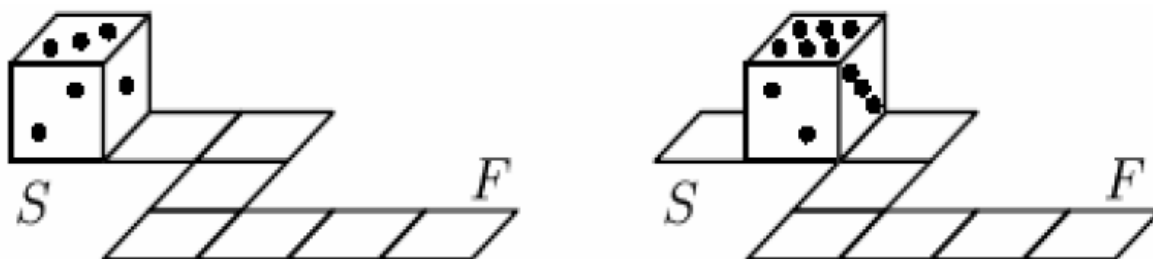
2.

Which side of the polygon shown in the picture is the shortest?



- A. DE      B. CD      C. ME      D. AM      E. BC

3.



The sum of the dots on any two opposite sides of a die is equal to 7. The die rolls along the path shown in the diagram. There are 3 dots on top of the die at the starting point.

What is the number of dots on top of the die when it gets to the square marked with the letter F?

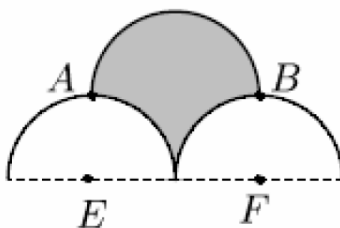
- A. 6      B. 5      C. 4      D. 3      E. 2

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## Round 5 cont.

4.

There are three semicircles (see the picture). The radius of each of the semicircles equals 2 cm. Quadrilateral ABFE is a rectangle. Points E and F are the centers of the bottom semicircles. The area of the shaded figure given in  $\text{cm}^2$  is equal to:



A  $2\pi$

B 7

C  $2\pi + 1$

D 8

E  $2\pi + 2$

5.

How many four-digit numbers have precisely three different digits, such as 2008?

A 2160

B 8999

C 4536

D 9000

E 1944

6.

Two different kind of bricks were produced. The dimensions of one kind are 10cm x 12cm x 14 cm and the dimensions of other are 12cm x 14cm x 16cm. By what percent is the volume of the larger brick greater than the volume of the smaller brick?

A by 20%

B by 30%

C by 40%

D by 50%

E by 60%