The Year 7 Maths Entrance Exam will include some questions which involve **problem solving**, **investigation** and/or **mathematical comprehension**. This is a sample of such questions.

Standard methods and their application to solving problems will still form a significant part of the test, but applicants will also be expected to engage with new material and think creatively.

14. Duncan and Jess have created a mathematical rule where 'the block' (■) of two numbers is the remainder when their sum is divided by 7.

For example, $3 \blacksquare 8 = 4$ because $3 + 8 = 11$ and the remainder when you divide 11 by 7 is 4.

and $3 \blacksquare 2 = 5$ because $3 + 2 = 5$ and the remainder when you divide 5 by 7 is 5.

a. Calculate $11 \blacksquare 9$

Answer: _____ **[1]**

b. Calculate $1 \blacksquare 11 \blacksquare 111$

Answer: _____ **[2]**

c. Find the least possible positive whole number a, **greater than 1,** such that $a \blacksquare a = 2$

$a =$ _____ **[2]**

d. Find the least possible positive whole number value b such that $22 \blacksquare b \blacksquare 50 = 1$

$b =$ _____ **[2]**

22. Work out the total number of triangles in this shape:

Answer: _____

15. Tara and Paul have created a mathematical rule where $[\,x\,]$ is the largest whole number that is **less** than x.

For example, $[\,3.17\,] = 3$ and $[\,90\,] = 89$ and $[\,-2.3\,] = -3$

a. Calculate $2.5 - [\,1.5\,]$

_____ [

b. Calculate $[\,5.4\,] + [\,3.7\,]$

_____ [

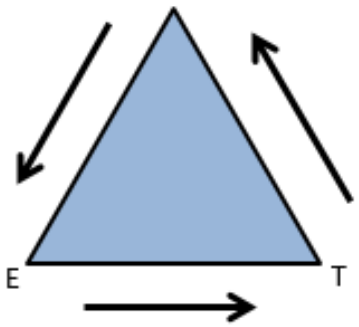
c. Calculate $[\,3.4 \times [\,1.23\,]\,]$

_____

d. Tara thinks that $[\,[\,2.86\,] \times [\,0.25\,]\,] = 0$, but Paul thinks the answer is -1.

Who do you agree with? Explain why.

30. Elizabeth and Tara race around a course in the shape of an equilateral triangle in the direction shown. Tara (T) starts one side length ahead of Elizabeth (E), and completes each circuit in 45 seconds. Elizabeth completes each circuit in 60 seconds, and they race until Tara catches Elizabeth.



(a) How long do they take to complete the race? (Give your answer in seconds.)

Answer (a): _____ sec [4]

(b) Suppose they continue running after Tara has caught up with Elizabeth. If Tara completes a total of 20 laps of the triangle, how many laps does Elizabeth complete in the same time?

Answer (b): _____[2]