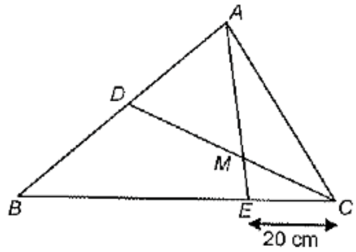
NMOS R2 考前必会重难点复习题

Geometry

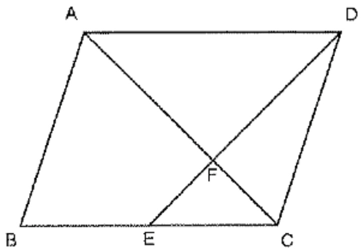
1.Swallow-Tail Model

（2014 R2 Q17） The figure below shows a triangle *ABC* with a point *D* located on the side *AB* such that $\frac{AD}{AC}=\frac{AC}{AB}=\frac{2}{3}$. The point *M* is the midpoint of *CD* while *AM* extended intersects *BC* at *E*. If $CE = 20$ cm, find the length (in cm) of *BE*.



2. Butterfly Model

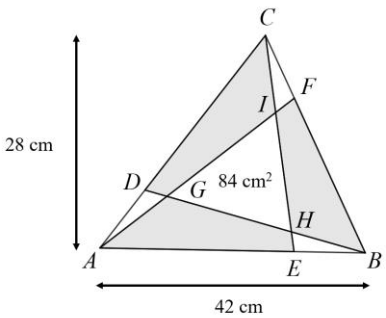
（2015 R2 Q14） In the parallelogram *ABCD* given below, *AB* is parallel to *CD* while *AD* is parallel to *BC*. It is given that $\frac{CE}{AD}=\frac{CF}{AF}=\frac{EF}{DF}=\frac{1}{2}$. Given that the area of *ABEF* is $25\ \text{cm}^2$, find the area of the parallelogram *ABCD*.



3. Bird-Head Model

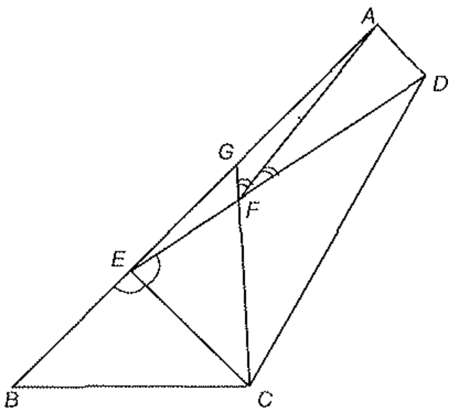
（2015 R2 Q19） In the diagram below, the base $AB = 42$ cm and the height of the triangle is 28 cm. It is known that the area of the triangle GHI is $84\ \text{cm}^2$.

Given also that $\frac{FC}{BC}=\frac{BE}{BA}=\frac{AD}{AC}=\frac{1}{3}$, find the total area of the shaded regions.



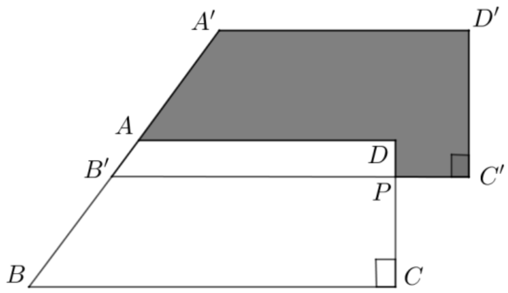
4. Angle

(2016 R2 Q19) In the diagram below, $ABCD$ is a quadrilateral. E is a point on AB such that $\angle BEC = \angle CED$. F is a point on the line segment DE such that $CE = EF$. G is a point on AE such that C, F and G are on the same straight line. If $\angle GFA = \angle AFD$ and $AF = EF$, find, in degree, $\angle AED$.



5. Principle of Fixed Difference

(2016 R2 Q2) The following figure shows two identical right angled trapezium $ABCD$ and $A'B'C'D'$, where $AB = A'B', BC = B'C', CD = C'D', DA = D'A'$ and $\angle BCD = \angle B'C'D' = 90°$. These two trapeziums overlapped and are placed such that AB and $A'B'$ are on the same line. If $BC = 20cm$, $CP = 7cm$ and $C'P = 4cm$, find the area, in cm^2, of the shaded region.



Counting

1. Counting Principle in Number Theory

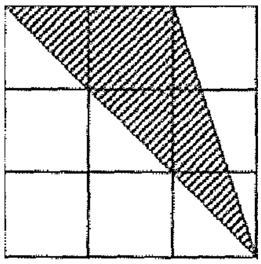
（2018 R2 Q5）Two distinct numbers from 1 to 100 inclusive will form a pair if the sum of these two is a multiple of 5. How many different pairs are there?

2. Inclusion and Exclusion

（2018 R2 Q7）One class of pupils took Math, Science and English tests. 30 pupils passed the Math test, 28 pupils passed the Science test, and 25 students passed the English test. If 43 pupils passed at least one test, at most how many pupils passed all three tests?

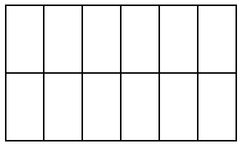
3. Figure Counting

（2022 R2 Q7）In the following 3 by 3 square grid, the area of each 1 by 1 square is 1 unit^2 . How many triangles could be formed by 3 points from the 16 vertex points such that its area would be the same as that of the shaded region?



4. Induction

（2019 R2 Q14）Find the total number of ways to pave a 2×6 block with 6 tiles of the size 1×2, assuming tiles of the same size are indistinguishable.



5. Dyeing Problem

（2016 R2 Q16）It is possible to colour the regions in Figure M using some (or all) of the colours 1, 2, 3 and 4 so that no two regions with a common boundary receive the same colour. See two examples below to the right of Figure M.

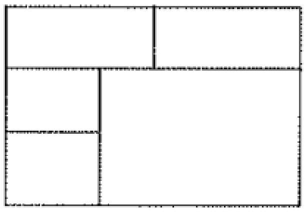
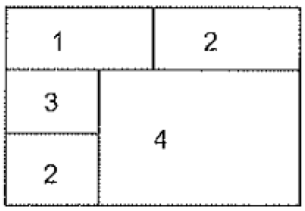
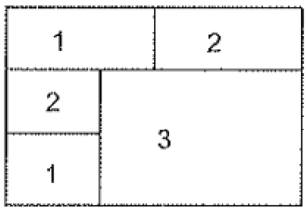


Figure M





How many different ways, including the above two way, can we colour Figure M?

Number theory

1. The last digit of number

(2019 R2 Q2) The operation $\langle A|B\rangle$ is defined as $\langle A|B\rangle = A\times(A+1)\times(A+2)\times\ldots\times(B-1)\times B$, where A is smaller than B, and A and B are whole numbers. For example, $\langle 3|8\rangle = 3\times 4\times 5\times 6\times 7\times 8$. What is the last digit of the sum $\langle 2006|2015\rangle + \langle 2016|2019\rangle$?

2. Number of Factors

(2022 R2 Q2) For any positive integer m, let $d(m)$ denote the number of positive factors of m. For example, $d(1)=1$, $d(4)=3$ and $d(6)=4$.

Let X and Y be the smallest three-digit and four-digit positive integers respectively such that $d(X)=d(Y)=d(2022)$. Find $X+Y$.

3. Perfect Square

(2015 R2 Q5) Note that $101^2 = 10201$. This is an example of a 3-digit whole number having its last 2 digits unchanged when it is squared.

How many 3-digit whole numbers from 100 to 999, including 101, have their last 2 digits unchanged when they are squared?

4. Characteristics of Multiples

（2015 R2 Q8）A palindromic number is a number that stays unchanged whether it is read from left to right or from right to left. For example, 121 is such a palindromic number. How many 3-digit palindromic numbers are not divisible by 11?

5. Remainders

（2022 R2 Q6）Let A be a two-digit number. It is known that the sum of A and 17 is a multiple of 5 , and the difference of A and 17 is a multiple of 6 Find the largest possible value of A.

Answer

Geometry
1. 45
2. 60
3. 420
4. 12
5. 126

Counting
1. 990
2. 20
3. 48
4. 13
5. 96

Number Theory
1. 4
2. 1103
3. 36
4. 82
5. 83