

Max 12	Max 24	
Stage Tot	Score	Marker

Put ID Sticker Here

# TARGET ROUND -- GRADE



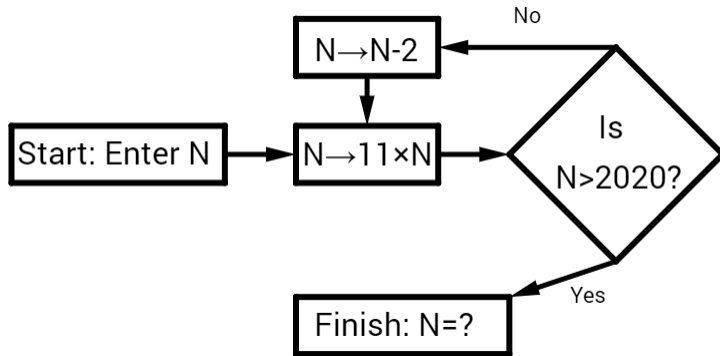
**NO Peeking: Wait for instructions to start!**

The region below is for the use of the markers

Max 4	Max 4	Max 4	Max 12	
Pr. 1-4	Pr. 5-8	Pr. 9-12	Stage Tot	Marker

1.  $N = 3$ . Enter the value of  $N$  into the flow chart.

What is the value of  $N$  at the Finish box?

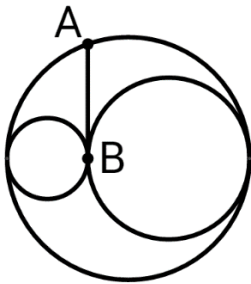


\_\_\_\_\_ 1

2. What is the remainder when you divide 2020 by the smallest positive number whose digit sum is 20? \_\_\_\_\_ 2

3. 3 circles with radii 1, 2, and 3 are tangent to each other.  $A$  is a point on the largest circle,  $B$  is the shared tangent point of the small circles, and the line segment  $AB$  is tangent to the small circles. What is the length of segment  $AB$ ?

Express the answer as  $M\sqrt{N}$  where  $M$  and  $N$  are primes.



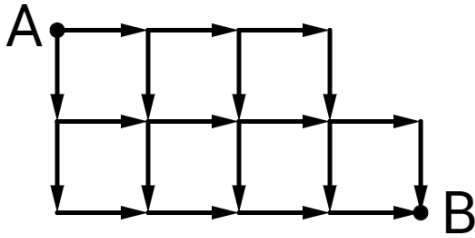
\_\_\_\_\_ 3

4. Mina has 4 white articles of clothing (a hat, a shirt, pants, and a scarf). She also has 4 black articles of clothing (a hat, a shirt, pants, and a scarf), 3 red articles of clothing (a shirt, pants, and a scarf), and 3 blue articles of clothing (a hat, a shirt, and pants). How many different outfits can she wear if she must wear at least a shirt and pants, and no two articles of clothing can be of the same colour? Note that she does not have to wear either a hat or a scarf. \_\_\_\_\_ 4

5. What is the value of  $2021^2 - 2019^2$ ? \_\_\_\_\_ 5

6. A mouse travels along the grid lines of the maze from point  $A$  to point  $B$ , travelling only down or to the right as specified by the arrows.

How many different paths can the mouse take from point  $A$  to Point  $B$ ?

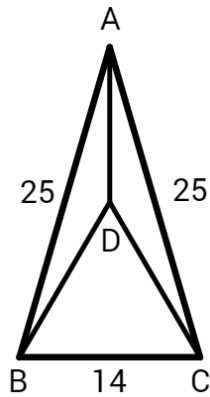


\_\_\_\_\_ 6

7.  $\triangle ABC$  is isosceles ( $AB = AC = 25$ , and  $BC = 14$ ).

The point  $D$  is inside  $\triangle ABC$  and  $\triangle BCD$  is equilateral.

What is the value of  $AD$ ? Express the answer as  $I - J\sqrt{K}$  where  $I$  is a whole number, and  $J$  and  $K$  are two different prime numbers.



\_\_\_\_\_ 7

8.  $N$  is a whole 3-digit number selected at random (every number has equal probability of being selected).

$M$  is derived from  $N$  in the following way: the value of the ten's (middle) digit of  $N$  is subtracted from the value of the hundred's (leftmost) digit of  $N$ , and the value of the unit's (rightmost) digit is added to it.

For example: if  $N = 369$ , then  $M = (3 - 6) + 9 = 6$ .

What is the probability that the value of  $M$  is 2?

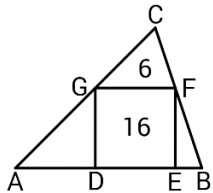
Express the answer as a fraction in lowest terms.

\_\_\_\_\_ 8

9. Ann bought some apples, pears, and oranges (at least one of each). She paid for them exactly \$6.00 (no change). The cost of each apple was \$0.49, the cost of each pear was \$0.59, and the cost of each orange was \$0.69. What is the maximum number of oranges that she could have bought? \_\_\_\_\_ 9

10. How many primes between 10 and 100 have their unit's digit smaller than their ten's digit? An example of such a prime is 41. \_\_\_\_\_ 10

11. The square  $DEFG$  is inside  $\triangle ABC$ . Points  $D$  and  $E$  are on  $AB$ , point  $F$  is on  $BC$ , and point  $G$  is on  $AC$ . The area of  $DEFG$  is 16 and the area of  $\triangle FGC$  is 6. What is the area of  $\triangle ABC$ ? Express the answer as a fraction in lowest terms.



12. Eric tossed a fair coin 7 times and the total number of "HEADS" that he got was 4. What is the probability that he got 4 "HEADS" in a row? Express the answer as a fraction in lowest terms. An example of a valid such toss is to get "HEADS" on the second, third, fourth, and fifth tosses. \_\_\_\_\_ 12