MATHCOUNTS® Problem of the Week Archive

2021 State Competition – March 7, 2022

Problems & Solutions

With 2022 State Competitions happening this month, here are some problems from the 2021 State Competition for extra practice!

2021 State Competition, Sprint Round, #7

Ben, Rachel and Teri collected seashells on a beach. Ben collected five more than twice as many seashells as Teri collected. Rachel collected seven less than four times as many seashells as Teri collected. If Ben and Rachel collected the same number of seashells, how many seashells did Teri collect?

*From the problem statement, we can write the equations B = 2T + 5, R = 4T − 7 and B = R. Since B = R, we can set the expressions for B and R equal to each other to get 2T + 5 = 4T − 7. Simplifying and solving for T, we get 12 = 2T, so T = 6. So, Teri collected **6** seashells.*

2021 State Competition, Sprint Round, #20

In Pierre's sports league, each team plays at most one game per day. Furthermore, no team is allowed to play games on three consecutive days, nor may any team play four or more games in any five consecutive days. Under these constraints, what is the maximum number of games Pierre's team could play in a 108-day interval?

*Let's not waste game days, so let's use the first 2, and we must skip day 3 to avoid 3 in a row. Then, we'll have a game on day 4, and we must skip day 5 to avoid more than 3 games in 5 days. We can repeat this 5-day pattern GG_G_ over and over without violating any restrictions. In 108 days, the full pattern can occur 21 times with 3 days leftover. At most, 2 games can be played in those 3 days. That yields a maximum total of 21 × 3 + 2 = **65** games.*

2021 State Competition, Target Round, #1

If *a*, *b* and *c* represent the distinct numbers 1, 2 and 3, in some order, what is the greatest possible value of the expression 817 × *a* + 512 × *b* + 210 × *c*?

*The sum of products is greatest when greater values for the variables go with greater numeric coefficients, so 817 × 3 + 512 × 2 + 210 × 1 = 2451 + 1024 + 210 = **3685**.*

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2021 State Competition, Sprint Round, #20

In Pierre's sports league, each team plays at most one game per day. Furthermore, no team is allowed to play games on three consecutive days, nor may any team play four or more games in any five consecutive days. Under these constraints, what is the maximum number of games Pierre's team could play in a 108-day interval?

2021 State Competition, Target Round, #1

If a, b and c represent the distinct numbers 1, 2 and 3, in some order, what is the greatest possible value of the expression $817 \times a + 512 \times b + 210 \times c$?