Use the time during the exam tutorial to go over the References they give you. You will not need to remember any of the formulae for Max. Moment, Shear and Deflection that re in the steel manual, they will be given to you on the test. During the tutorial you can write down the basic ones so you have them next to you as a reference, and you don’t have to go back and forth to the reference screen. Also during that time I wrote down the formulae that I did memorize just for reference later. That way you are not double guessing yourself on the units when you are under time pressure. I also marked all the math questions and did them at the end.

Here is some advice from David Thadeus that I found very helpful:

“As far as memorizing the formulas, it is by far more important to know what is involved in a formula, rather than memorize it without fully comprehending how and when it applies. I am trying to emphasize that there is a fair amount of "qualitative" questions about the formulas themselves.

As for the radius of gyration, it is important to recognize that it is strictly a property of the geometry of the section \((r = (\text{SQRT} \ (	ext{I}÷\text{A})))\) and is critical in the assessment of the slenderness of steel columns. The lesser the radius of gyration, the more likely a steel column is to buckle (the other factors that affect the slenderness of a steel column are its un-braced length and how strongly its ends are connected.”

Make sure you know the concepts behind the formula, which will in turn help you to remember the formula itself better. For example in the deflection formula the span of a beam \((L)\) is to the 3\(^{rd}\) power (cubed) where the load \((W)\) is to the 1\(^{st}\) power; therefore increasing the span of a beam will impact its deflection much more than if you increase the load. Similarly values in the denominator they will impact the result differently than values is in the numerator.

As far as which formulae to remember, I found that I only needed to remember 3 or 4 and knowing a bit of algebra you can solve for any variable:

# Modulus of Elasticity formula:

\[
E = \frac{\text{Stress} \ (F)}{\text{Strain}} \quad \text{or} \quad E = \left(\frac{P}{A}\right) \div \left(\frac{\text{Deformation} \div L}{E}\right)
\]

and all the variations of that formula

i.e.: \(\text{Deformation} = \left(\frac{P \times L}{A \times E}\right)\)
# Section Modulus formula:

\[ S = \frac{M}{F_b} \] and know how to solve for each variable

ie: \( M = F_b \times S \) & \( F_b = M \div S \)

Also know that \( S = \frac{I}{c} \) and therefore \( F_b = \frac{Mc}{I} \)

They will give you \( S = b \times d^3 \div 6 \)

# Formula for Shear

\[ F_v = \text{const.} \times \frac{V}{A} \] and same as above know how to solve for each variable

# Coefficient of thermal expansion (n) is the ratio of unit strain to temperature change and is constant for a given material.

\[ n = \frac{\Delta}{L} \Rightarrow \Delta = n \times L \times t \]

\[ \Delta = \frac{P(L)}{AE} \quad P = \frac{\Delta E}{A \times L} \]

# They will give you most of the geometry formulae for the area, moment of Inertia (I) and Section Modulus (S) for rectangular shapes and other basic shapes, but not the area of a circle - so remember the formula for the area of a circle and it’s circumference.

# Although they will give the Deflection formulae, know that Delta \( L = (\text{Const.} \times \text{Load} \times \text{Span}^3) \div (E \times I) \)

# Know how to solve for angles and legs of a triangle, all I needed on my test was the basic:

\[ a^2 + b^2 = c^2 \]

\( \text{Sin} = \text{opposite} \div \text{hypotenuse}, \text{Cosine} = \text{adjacent} \div \text{hypotenuse} \) and \( \text{Tangent} = \text{rise} \div \text{run} \)

# Know how to figure the loads on tributary areas.

# Know how to figure out reactions.

# For the 2 moving load problem, the formula is in the steel manual, but all you need to know is how to figure the reactions at the worst case scenario, for shear it would be with the loads closest to the supports and for bending it would be with the loads at the center, then treat them as regular point loads.
Math problems are really only about 15% to 20% of the test, the rest of it will be questions on general knowledge of how structures work, what is the best system for a given situation, and some on cost in general. Look at the reference list NCARB suggests for this division and go to the library they have a few of them.

GOOD LUCK!!