

# Activity 2 1 7 calculating truss forces

## answers

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**How do you solve truss forces?**

**When solving truss forces, why is it important to know that the structure is statically determinate?** It is important to know that a truss is statically determinate before attempting to solve for the internal forces. If the truss is statically indeterminate, then you will not be able to solve for all of the forces.

**What is the significance of including roller connections rather than pinned connections?** Roller connections are significant because they provide more flexibility in a structure compared to pinned connections, making them particularly beneficial in situations involving thermal expansion or contraction.

**How to calculate the force in a member?**  $\text{Force C} = \text{Force B} \cdot \cos \phi$ ; if FC is the purely horizontal member that is attached to the same point as B, and  $\phi$  is the angle between them.

**What is the formula for calculating trusses?**  $\text{Truss count} = ((\text{roof length} \cdot 12) / 24) + 1$  The simplest form of this equation is to take the length of your roof and divide it by 2. For example, if your roof is 40-feet long, it will need a total of 20 trusses.

**What is the formula for a truss joint?** Method of joint: This method involves isolating each joint of the truss and considering the equilibrium of the joint when determining the member axial force. Two equations used in determining the member axial forces are  $\sum F_x = 0$  and  $\sum F_y = 0$ .

**What method do we use when solving truss calculations?** The method of joints is a process used to solve for the unknown forces acting on members of a truss. The method centers on the joints or connection points between the members, and it is most useful when you need to solve for all the unknown forces in a truss structure.

**What is the formula for a determinate truss?** Formulae: If the truss has  $j$  joints ?  $2j$  equations of equilibrium. Unknowns: No of reactions  $r$ , and no of member forces  $m$ . Test covers three categories: Truss is statically determinate:  $m + r = 2j$ . If  $m + r < 2j$  ? Truss is unstable.

**What is the formula for the indeterminacy of a truss?** Thus, the Degree of internal indeterminacy for a plane truss is  $m - (2j - 3)$ . The equations of static equilibrium available in order to find reaction forces in a plane truss is 3 ( $H = 0$ ,  $V = 0$ ,  $M = 0$ ).

**What is the difference between a pin and a roller truss?** Examples include door hinges and the joints in truss structures. In nutshell the main difference lies in their degrees of freedom. A pin joint primarily allows rotation, while a roller joint allows both rotation and translation.

**What is an example of a simple support?** Simple Support The member simply rests on an external structure to which the force is transferred to. In this case, if you apply a vertical force it will not be able to support it. An example is a plank of wood resting on two concrete blocks.

**How many reaction forces does a roller have?** The roller only keeps the object from moving vertically, so there is only 1 force. The pinned restraint doesn't allow horizontal or vertical movement, hence the two forces. The fixed beam restricts vertical translation, horizontal translation, and rotation, so there is a moment and two forces.

**How to solve a simple truss problem?**

**Is tension positive or negative truss?** Tension and Compression If a member experiences neither a tensile or compressive force, then it is called a "zero-force member." When solving a problem, tension is always written as a positive value, and compression is always written as a negative value.

**What are the examples of truss?** A truss is a rigid engineering structure made up of long, slender members connected at their ends. Trusses are commonly used to span large distances with a strong, lightweight structure. Some familiar applications of trusses are bridges, roof structures, and pylons.

**How to calculate forces in members of a truss?** Method of joint: This method involves isolating each joint of the truss and considering the equilibrium of the joint when determining the member axial force. Two equations used in determining the member axial forces are  $\sum F_x = 0$  and  $\sum F_y = 0$ .

**How do you solve truss by force method?**

**What is truss calculator?** Our truss calculator computes the best dimensional method to connect the pieces of the truss. This will be done with steel joints and a bridge, added to support the weight of the entire truss.

**What is the formula for a simple truss?** In a simple truss,  $m = 2j - 3$  where  $m$  is the total number of members and  $j$  is the number of joints. A simple truss is constructed by successively adding two members and one connection to the basic triangular truss. In a simple truss,  $m = 2j - 3$  where  $m$  is the total number of members and  $j$  is the number of joints.

**What is the formula for truss strength?** A formula is now applied to the truss to calculate load strength. The formula, which can be written as  $M+3=2*N$ , says that the number of members of a truss plus 3 must equal twice the number of nodes. When both sides of this equation are equal, the roof is stable and can support stressful loads.

**What is the formula for the area of a truss?** Next, we'll need to calculate the area of the face of the truss that will be sheathed. We'll start with a flat truss: The truss is 24-0-0 in length and 4-0-0 tall. Multiply the Span by the Height to calculate the area:  $24\text{ft} \times 4\text{ft} = 96 \text{ sq-ft. area.}$

**What are the rules for trusses?** Rule: If three members form a truss joint for which two of the members are collinear and there is no external load or reaction at that joint, then the third non-collinear member is a zero force member. Zero-force members can be removed when analyzing the truss.

**What is the formula for trusses and frames?** Trusses and Frames Question 2 Detailed Solution A perfect frame should satisfy the following expression:  $m = 2j - 3$  where  $m$  = Number of members, and  $j$  = Number of joints. An imperfect frame is one that does not satisfy the above equation ( $m \neq 2j - 3$ ). If  $m < 2j - 3$  then the frame is called a deficient frame.

**What are the forces acting on a truss?** A force applied to the truss structure will only produce compression or tension on the elements. (c). Tension - compression forces' directions are parallel to the elements. (d).

**How do you calculate truss work?** What is the formula of roof truss? The formula is truss count =  $((\text{roof length} \times 12)/24) + 1$ . This equation will help you determine how many trusses your roof needs. For example, if your roof is 30 feet long, you will need 16 trusses.

**What is the equation for a perfect truss?** The simplest perfect truss is a triangle, which contains three elements and three joints. Generally eq. (1) is used to find if a particular combination of element and joint would form a stable determinant truss. [1]  $n = 2j - 3$  where  $n$  and  $j$  are the numbers of elements and joints, respectively.

**What is the formula for the slope of a truss?** The pitch of a roof truss (Rise/Span) should be 1/4 to 1/6 to its slope for proper drainage and slope = 2 times pitch. The spacing of roof trusses is kept 1/3 to 1/5 of the span.

**What is the formula for the height of a truss?** An approximate height of a pitched truss can be calculated with the following formula: take 1/2 the span and multiple it by the pitch. Then add about 4 in. for the top chord lumber.

**How to find the degree of truss?**

**What is the formula for the stability of a truss?** If  $M + R < 2J$ , the truss will be unstable and will collapse under the load. The  $2J$  term in Eq. (1) is based on the fact that the forces acting at a given joint form a two-dimensional concurrent force system allowing the use of only two force equilibrium equations.

**What is the strongest truss pattern?** In this experiment we have tested which type of truss bridge is the strongest, yet uses the least amount of material. Two of the

most used truss bridges are of the Pratt and Howe design. Through our experiment it was found that the bridge design that minimized the maximum compression force was the Howe Bridge.

**Are trusses stronger than beams?** For the same steel weight, it is possible to get better performance in terms of resistance and stiffness, with a truss than an I beam. This difference is greater for long spans and/or heavy loads.

**What are the three main types of trusses?** Trusses are most often used in the construction of roofs, bridges, and towers. There are three basic versions of truss structure, simple, planar, and space frame.

**What is the formula for the plane truss?** For a joint we can write 2 equilibrium equations, so for  $j$  joints we will have  $2j$  equations. If there are  $m$  members in a truss then we need to calculate  $m$  unknowns. Also we need to calculate 3 reactions for a plane truss. So for determinate truss  $m + 3 = 2j$ .

**What method do we use when solving truss calculations?** The method of joints is a process used to solve for the unknown forces acting on members of a truss. The method centers on the joints or connection points between the members, and it is most useful when you need to solve for all the unknown forces in a truss structure.

**What is the method of sections to solve a truss?** The method of sections is used to solve for the unknown forces within specific members of a truss without solving for them all. The method involves dividing the truss into sections by cutting through the selected members and analyzing the section as a rigid body.

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**What is the truss structure equation?** Forces exerted by a member on the pins or joints at its ends are directed along the member and equal and opposite. Conditions of equilibrium on the pins provide  $2n$  equations for  $2n$  unknowns. For a simple truss,  $2n = m + 3$ . May solve for  $m$  member forces and 3 reaction forces at the supports.

**What is an example of a truss?** The traditional diamond-shape bicycle frame, which utilizes two conjoined triangles, is an example of a simple truss.

**What are the rules for trusses?** Rule 1: If two non-collinear members meet at an unloaded joint, then both are zero-force members. Rule 2: If three forces (interaction, reaction, or applied forces) meet at a joint and two are collinear, then the third is a zero-force member.

**How to solve truss easily?**

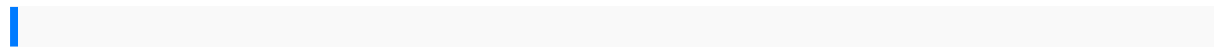
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**What are 4 examples of structures that use trusses?** Trusses are used in a broad range of buildings, mainly where there is a requirement for very long spans, such as in airport terminals, aircraft hangers, sports stadia roofs, auditoriums and other leisure buildings. Trusses are also used to carry heavy loads and are sometimes used as transfer structures.

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**How do you find the tension and compression of a truss?** A truss member can only support a force along its axis, which would either pull or push on it. If the member is being pulled, it is said to be in tension, and if it is being pushed, it is said to be in compression.

**What is the formula for the indeterminacy of a truss?**



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ACTIVITY 2 1 7 CALCULATING TRUSS FORCES ANSWERS

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