

### Lesson #1: Scale, Floor Framing Model (15 Days)

#### Objectives

##### Students will be able to...

- Calculate area
- Use the Pythagorean Theorem to establish/check layout and framing for square. (3,4,5)
- Develop a bill-of-materials using linear measurement, perimeter, and area to estimate materials quantities.
- Layout and construct a scale model floor frame using blueprints.
- Identify the name and purpose of the members involved in the construction of stick framed walls, and how they are assembled.
- Assemble a floor frame using the correct materials in the correct order.
- Assess floor framing adherence to code, cleanliness, and accuracy (compared to the prints and to scale).

#### Common Core Standards

LS 11-12.6  
RSIT 11-12.2  
RHSS 11-12.7  
Problem Solving and Critical Thinking 5.1  
Health and Safety 6.2, 6.3, 6.4, 6.5, 6.6  
Mathematics 1.1  
Communication 2.2  
Responsibility and Flexibility 7.0  
Leadership and Teamwork 9.0, 9.2  
Technical Knowledge and Skills 10.0, 10.1, 10.2, 10.3  
Demonstration and Application 11.0  
Residential and Commercial Pathway D1.2, D1.3, D1.4, D1.5, D2.1, D2.2, D3.1, D3.2, D3.3, D4.1, D4.3, D5.2, D6.2, D6.4, D 9.2, D9.4

## Materials

Pythagorean Theorem Worksheet

Area Worksheet

Floor Framing Vocabulary Worksheet

11x17 copies of the 20x20 house floor framing print (PDF Attachment)

<https://documentcloud.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3Aef6af132-1d0a-4065-aa3c-0bea5a19a7ed>

Bill of Material Worksheet

Floor Framing Inspection Guidelines

Floor Framing Inspection Grade Sheet

Building Permit Worksheet

24inch x 24 inch lot and marker

Nail schedule illustration

Correction Notice

Reflection

## Lesson Sequence

- Review how to find the area of a square and use the Pythagorean theorem. Pass out *Area Worksheet* and *Pythagorean Theorem Worksheet*.
- Pass out the *Floor Framing Vocabulary Worksheet*. Go over each definition and have students copy definitions down on their worksheets.
- Pass out and review the *Floor Framing inspection guidelines* and *Floor Framing Inspection Grade Sheet* with the class. Answer any questions.
- Hand out *11x17 copies of the 20x20 house floor framing print*. Along with the *Bill of Material Worksheet*. Begin to discuss the process of building the house floor framing model and what materials will be needed. Have students fill in Bill of Materials throughout the discussion. Allow students time to fill in their worksheet and then discuss their results as a class.
- Once students have their Bill of Materials created, ask for shop volunteers for clean up using the job descriptions. Have students get into teams of 3-4 students for their building team.
- Pass out the *Building Permit Worksheet*. Have each team fill out a building permit. Support students as needed.
- Distribute a *24-inch x 24-inch "lot" and marker* to each team. The teams should label the bottom of their lots with their names.
- Take the class and their blueprints into the shop. Model how to center their house on

the lot and layout for the sill-plates. Explain that their houses are to be built in one-inch scales, meaning that for every foot of the full-sized structure it will equal one inch on their models.

- Allow students a few days to begin working on their projects.
- When student reach the time of installing subflooring/sheeting review the ***Nailing Schedule*** illustration as a class. Remind students that the first number is the “edge nailing” number and it means that wherever we have material (joists, beams etc.), directly under the ends and edges of our sheeting, we need to have nails placed every six inches on center-show a visual of this.
- Allow students time to install their subflooring-support students as needed.
- Fill out the ***Correction Notice*** for teams that have things they need to fix along the way.
- When students are finished with their floor framing have students put them on display and allow classmates to look at one another’s. Have students fill out a ***Reflection***.

### Assessment

Monitor student progress throughout process through checking for understanding, information observations, and scaffolding.

Support students along the way by passing out a “correction notice” when students have areas of improvement that they need to correct.

Use the floor framing grade sheet to assess student’s final floor framing model.

### Accommodations/Modifications

Strategic Partners

Modeling

One on One Support

Check for Understanding

Calculators

Extra Time If Needed

## Pythagorean Theorem Worksheet

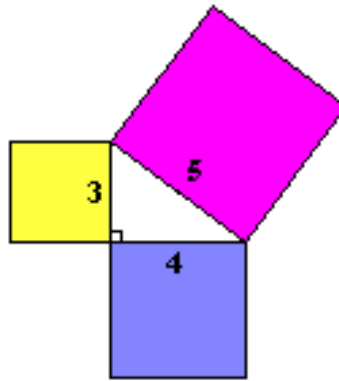
**Technical Definition:** In a right-angled triangle the square of the hypotenuse is equal to the sum of the squares of the other two sides.

Simply put, the long part of a right-angle triangle (i.e. a triangle with one 90° angle) is the hypotenuse. If you drew a perfect square from each side of the triangle, then the area of the two sides (i.e. each side individually "squared") added together would equal the long part of the triangle's (hypotenuse) square area.

Therefore...  $a^2 + b^2 = c^2$

A and B representing the two 90° sides.

Let's see if this works:



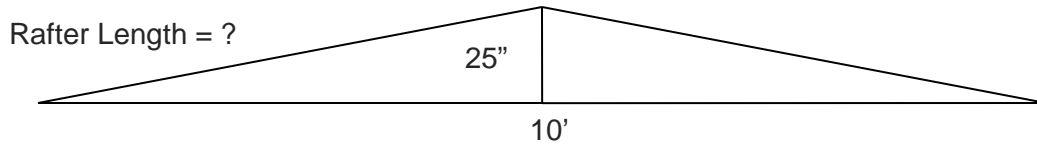
$$3^2 + 4^2 = 5^2 \text{ or } 9 + 16 = 25$$

YES! It Does Work!

Practice:

1. You are conventionally framing a gabled roof. Your ridge is 25" high and the structure's width is 10'.

How long should each rafter be?



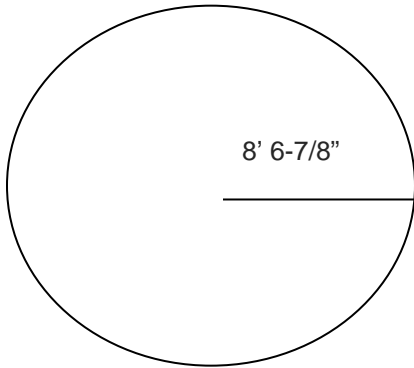
2. You must build a staircase connecting the first and second floors of a custom home. The first floor is 9' high. The stair stringers must be 15' long. What is the horizontal footprint of the staircase?
  
3. Using the horizontal footprint measurement, you established in question 2, calculate the **area** of the staircase footprint assuming the stairs are 4' wide.

*\*Remember to record your answers in square units.*

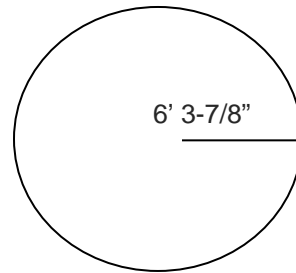
**Area Worksheet**

Directions: Find the area of each drawing and enter your answers below.

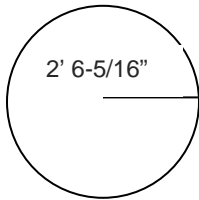
1.



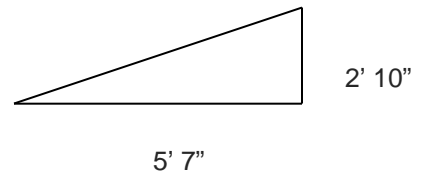
2.



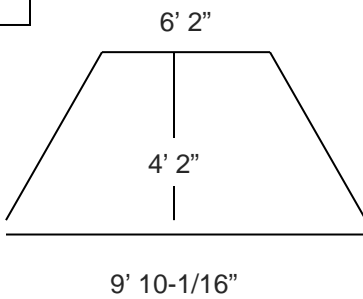
3.



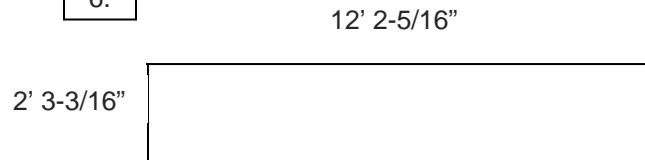
4.



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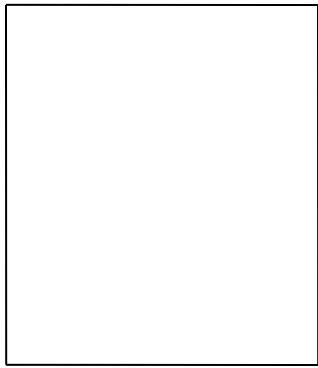


6.



**BUILDING INDUSTRY TECHNOLOGY ACADEMY: YEAR ONE CURRICULUM**

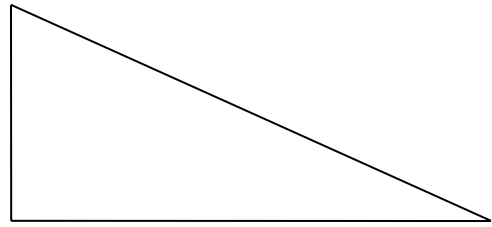
7.



10' 8-11/16"

7' 8-1/4"

8.



5'

10'

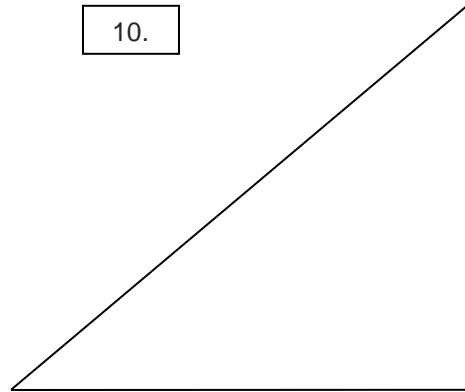
9.



4' 10"

11' 11-3/16"

10.



11' 4"

7' 8"

1.	6.
2.	7.
3.	8.
4.	9.
5.	10.

**Floor Framing Vocabulary Worksheet**

1. Scale:

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2. Foundation:

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3. Footing/stem wall:

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4. Subfloor:

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**BUILDING INDUSTRY TECHNOLOGY ACADEMY: YEAR ONE CURRICULUM**

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5. Anchor bolts/hold downs:

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6. Sill plate:

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7. Joist:

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8. Rim joist:

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9. Girder/beam:

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10. Blocking/bridging:

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11. Subfloor adhesive:

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12. Sheeting:

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13. Nail/screw schedule:

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## Floor Framing Inspection Guidelines

When inspecting, or being inspected, two criteria must be met.

1. Is the structure built to code?
2. Does the structure build to the prints?

If either of these criteria is not met at any time during the construction of any structure, then that structure will fail inspection. Failed inspections can hurt your production schedule, budget, and ultimately your company.

1. Does the model scale-out to be 20' x 20'? \_\_\_\_\_
2. Is the sill plate pressure treated? \_\_\_\_\_
3. Are the anchor bolts spaced according to code? \_\_\_\_\_
4. Are the floor joists placed at a scale of 16" on-center? \_\_\_\_\_
5. Do the floor joists run the right direction when compared to the prints? \_\_\_\_\_
6. Are the mid-span blocks installed at mid-span? \_\_\_\_\_

To successfully pass inspection, the model of the construction company you are inspecting must meet **all** the above codes and specifications (specs). Even if only one code or spec is not met, the model (and the company that built it) will fail the inspection. If you pass a model's floor framing, you must justify your decision in writing. You must explain how/why the model floor framing passed inspection as opposed to failed. Your report must be at least one half of a page long, and spelling and grammar count. If these writing requirements are not met, then all the employees of your company will be penalized by a loss of points on the assignment.

If you fail a company for a violation of any of the codes/specs listed above, you must record why they failed, and what they must do to correct the problem(s). You must fill out a "Correction Notice" and leave it with the company president of the model floor you are inspecting. Your construction team will inspect the floor as a group, but writing the report is done by only one member of the company. There will be five inspections: Two for floor framing, two for wall framing, and one for roof framing. Every member of your company must take a turn writing at least one report during the construction phase of this project.

## Floor Framing Inspection Grade Sheet

When you have completed framing your model floor, you must have it inspected/graded before you can move on to the installation of the sub-floor/sheeting. The following are the criteria by which your floor frame will be graded, including the points available for each area.

- |   |            |
|---|------------|
| 1. Does the model scale-out to be 20'x20'?                                  | /30 points |
| 2. Is the sill plate pressure treated?                                      | /5 points  |
| 3. Are the anchor bolts spaced according to code?                           | /15 points |
| 4. Are the floor joists place at a scale of 16" on-center?                  | /25 points |
| 5. Do the floor joists run the right direction when compared to the prints? | /30 points |
| 6. Are the mid-span blocks installed at mid-span?                           | /20 points |

**Total points for floor framing /125 points**

When you have successfully passed inspection, and received a grade for your floor frame, you will be approved to begin installing the sub-flooring/sheeting. The following are the criteria by which your sub-flooring will be graded, including the points available for each area.

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|--|------------|
| 7. Is the sheeting/sub-flooring installed on the floor joists according to code? | 3/0 points |
| 8. Are the courses of sheeting/sub-flooring staggered according to code?         | /30 points |
| 9. Is the edge and field nailing according to the schedule?                      | /15 points |

**Total points for sub-flooring /75 points**

**Total points available for flooring installation /200 points**

# BUILDING INDUSTRY TECHNOLOGY ACADEMY: YEAR ONE CURRICULUM

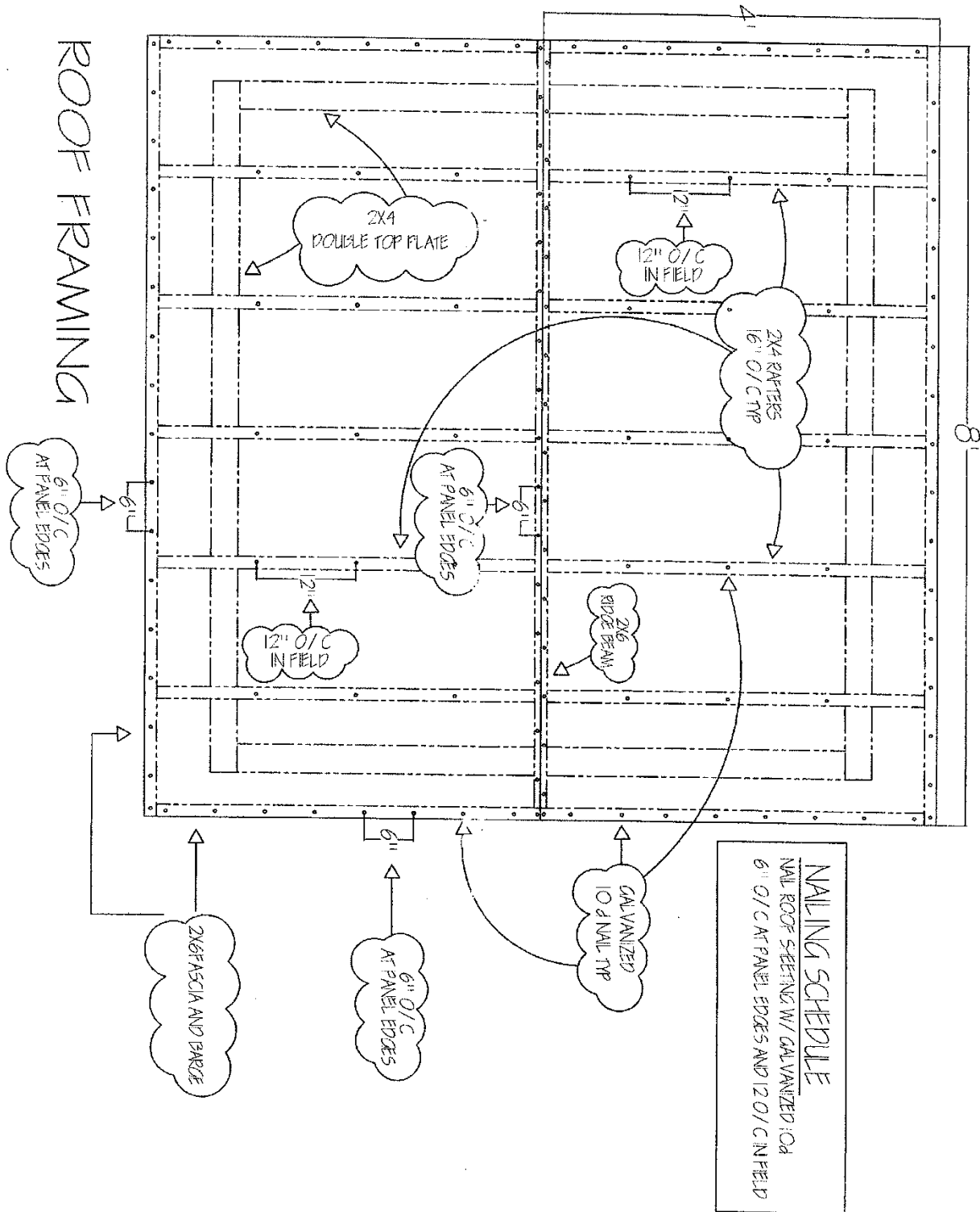
## APPLICATION FOR BUILDING PERMIT

Building Industry Technology Academy

Please **TYPE** or **PRINT** clearly in ink.

Date:			
Project Address:			
Description of Work:			
Total Square Feet:		Cost of Construction: \$	
Property Owner Name:		Telephone Number:	
Property Owner Address:			
Contractor Name:		Telephone Number:	
Contractor Address:			
Contractor e-Mail Address:			
Contact Person:		Telephone Number:	
Contact Person e-Mail address:			
Architect:		Telephone Number:	
I hereby certify that the information contained in the application and accompanying drawings or plans is correct, and that I will conform with all applicable laws of the Building Industry Technology Academy.			
Signature of Applicant:			Date:
<b>FOR OFFICE USE ONLY</b>		<b>APPROVALS</b>	
Permit #			Bin Number:
Zoning Site Plan Review:	Date:	Building Plan Review:	Date:
Conditional Use: ____ Yes ____ No	Site Plan Approved: ____ Yes ____ No	Authorization Form Received: ____ Yes ____ No	
Notes:			
Plans: ____ Attached ____ Rolled ____ None		COP: ____ NOT Required ____ Required ____ In-house ____ Attached	
Minimum Fee: \$	Credit Card Receipt #:		A/P Receipt #:
Total Fee: \$	Credit Card Receipt #:		A/P Receipt #:

**Nail Schedule Illustration**







### Reflection

Directions: Write a reflection on the processes you went through on the Hand Tool Project. Successes, pitfalls, ultimate accomplishment, etc. "What I learned. . . what I liked . . . what I didn't like . . ." etc.

1. What I have learned from this project is.....

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2. What more I would like to learn after this project is....

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3. What I have learned that I should keep on doing, from this point on, to ensure an excellent outcome on other projects...

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