Live load—pounds per square foot	Spacing	2 inches wide by depth of—					3 inches wide by depth of—				
		6	8	10	12	14	6	8	10	12	14
10	12	12- 9	16- 9	21- 1	24- 0	—	14- 7	19- 3	24- 0	—	—
	16	11- 8	15- 4	19- 4	23- 4	24- 0	13- 6	17- 9	22- 2	24- 0	—
	24	10- 3	14- 6	17- 3	20- 7	24- 0	11-11	15- 9	19-10	23- 9	24- 0
20	12	11- 6	15- 3	19- 2	23- 0	24- 0	13- 3	17- 6	21- 9	24- 0	—
	16	10- 5	13-11	17- 6	21- 1	24- 0	12- 0	16- 1	20- 2	24- 0	—
	24	9- 2	12- 3	15- 6	18- 7	21- 9	10- 6	14- 2	17-10	21- 6	24- 0
30	12	10- 8	14- 0	17- 9	21- 4	24- 9	12- 4	16- 4	20- 5	24- 5	—
	16	9- 9	12-11	16- 3	19- 6	22- 9	11- 4	14-11	18- 9	22- 7	26- 4
	24	8- 6	11- 4	14- 4	17- 3	20- 2	10- 0	13- 2	16- 8	19-11	23- 4
40	12	10- 0	13- 3	16- 8	20- 1	23- 5	11- 8	15- 4	19- 3	23- 1	26-11
	16	9- 1	12- 1	15- 3	18- 5	21- 5	10- 8	14- 0	17- 8	21- 3	24-10
	24	7-10	10- 4	13- 1	15- 9	18- 5	9- 4	12- 4	15- 7	18- 9	22- 1
50	12	9- 6	12- 7	15-10	19- 1	22- 4	11- 0	14- 7	18- 4	22- 0	25- 8
	16	8- 7	11- 6	14- 7	17- 6	20- 5	10- 0	13- 4	16-10	20- 3	23- 8
	24	7- 3	9- 6	12- 1	14- 7	17- 0	8-10	11- 9	14-10	17-10	20-10
60	12	9- 0	12- 0	15- 2	18- 3	21- 4	10- 6	14- 0	17- 7	21- 1	24- 7
	16	8- 1	10-10	13- 8	16- 6	19- 3	9- 7	12-10	16- 1	19- 4	22- 7
	24	6- 8	8-11	11- 3	13- 7	15-11	8- 5	11- 3	14- 1	17- 0	20- 0
70	12	8- 7	11- 6	14- 6	17- 6	20- 6	10- 1	13- 5	16-11	20- 5	23- 9
	16	7- 8	10- 2	12-10	15- 6	18- 3	9- 3	12- 3	15- 5	18- 7	21-10
	24	6- 5	8- 5	10- 7	12- 9	15- 0	8- 0	10- 7	13- 4	16- 1	18-10

Maximum spans for joists.

Live Load = 40 lbs per / sq. ft (Variable)

Dead Load = 10 lbs per / sq. ft (Fixed Weight)

Joist Spacing = 16" O.C. (On Center)

Joist Span = Distance Floor Must Cover

Name _____

Quiz Joist Spans

Live Load 40 lb/sqft

Joist Spacing 16o/c

Use chart on page 756

Answer the following:

If your joist span is _____, what size joist will you need?

1. 18' _____
2. 14' _____
3. 12' _____
4. 13'6" _____
5. 8'9" _____
6. 11'7 _____
7. 15'2" _____
8. 18'5" _____
9. 22" _____
10. 6' _____

Basement Girders and Posts

Concrete Pad Supports Posts 24"x 24"x 12"

Post 8'-10' Apart 2 Story house

10'-12' Apart 1 Story house

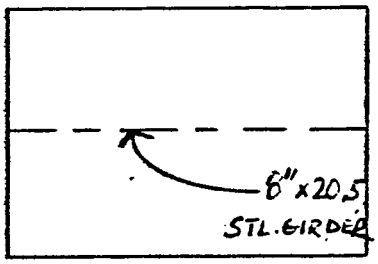
Live Load = 40 lbs per / sq. ft (Variable)

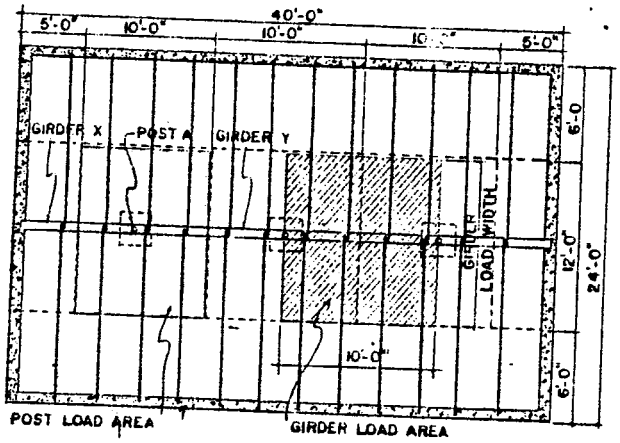
Dead Load = 10 lbs per / sq. ft (Fixed Weight)

Live Load + Dead Load = 50 lbs per / sq. ft

Girder Load Area(GLA) x 50 lbs per / sq. ft = Total Weight

How to lable the Girder on your drawing





Example:
Basement Size 24'-0"x 40'-0"
Girder Load Area 10'-0"x12'-0"=120sq. ft
(GLA) 120sq. ft x Live+ Dead Load 50 lbs per / sq. ft = Total Weight 6000lbs
Kip = 1000 pounds then 6000lbs=6 Kip
Use your chart to find the answer using the following information :
Span between posts is 10'-0"
Total Weight is 6 Kip
What size steel girder would you need to safely support your house?
What size wood girder would you need to safely support your house?

Safe Load For Wood Girders

Girder size	Safe load in lbs. for spans from 6 to 10 feet.				
	6 ft.	7 ft.	8 ft.	9 ft.	10 ft.
6 x 8 solid	8,306	7,118	6,220	5,539	4,583
6 x 8 built-up	7,359	6,306	5,511	4,908	4,062
6 x 10 solid	11,357	10,804	9,980	8,887	7,997
6 x 10 built-up	10,068	9,576	8,844	7,878	7,086
8 x 8 solid	11,326	9,706	8,482	7,553	6,250
8 x 8 built-up	9,812	8,408	7,348	6,544	5,416
8 x 10 solid	15,487	14,732	13,608	12,116	10,902
8 x 10 built-up	13,424	12,768	11,792	10,504	9,448

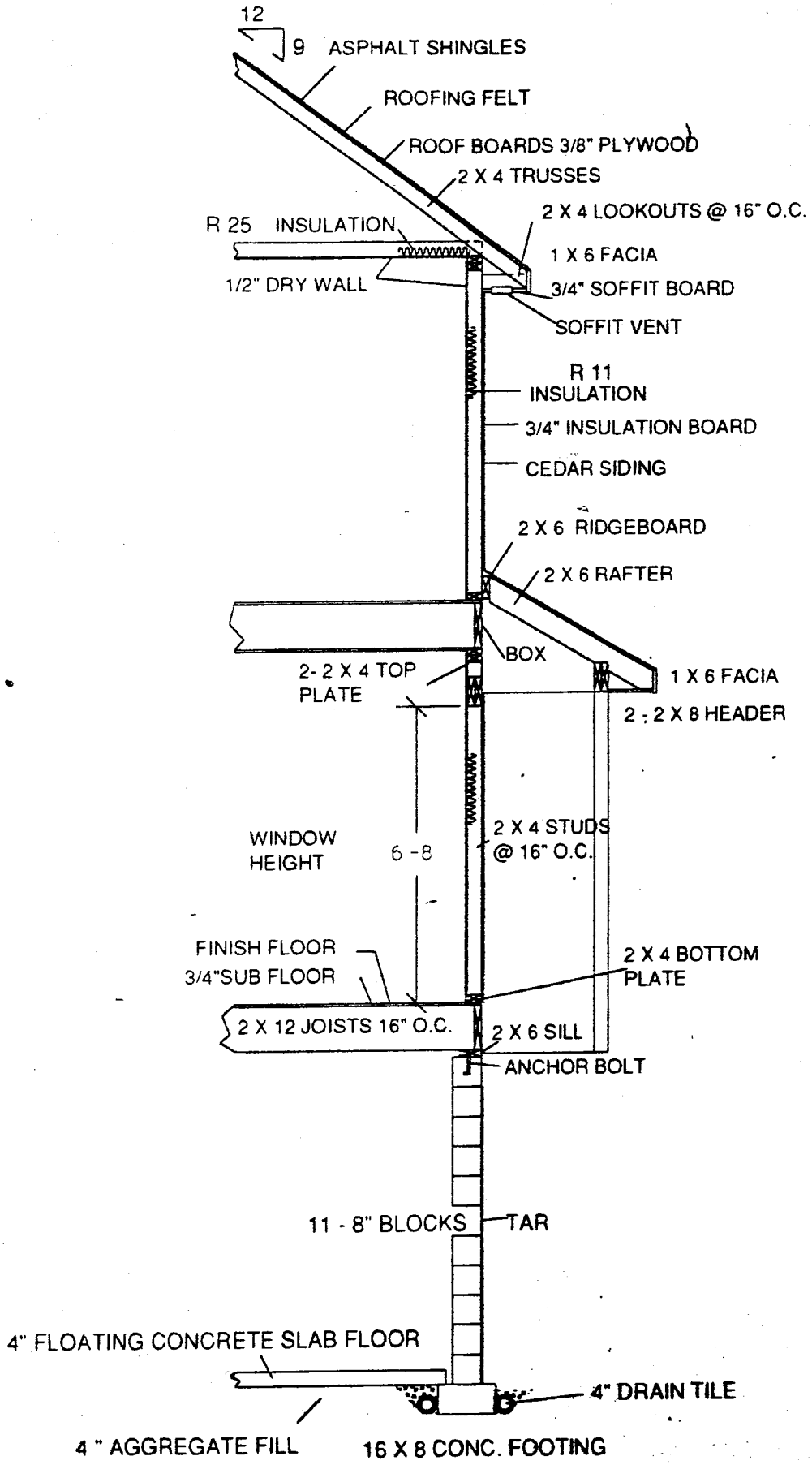
Safe Loads For I - Beams

SPAN IN FEET	Weight per foot	4 inches deep by—				5 inches deep by—			6 inches deep by—			7 inches deep by—		
		7.7	8.5	9.5	10.5	10.0	12.25	14.75	12.5	14.75	17.25	15.3	17.5	20.0
	4	9.0	9.5	10.1	10.7	14.5	16.2	18.0	21.8	23.8	26.0	31.0	33.4	36.0
	5	7.2	7.6	8.0	8.5	11.6	13.0	14.4	17.4	19.0	20.8	24.8	26.7	28.7
	6	6.0	6.3	6.7	7.1	9.7	10.8	12.0	14.5	15.9	17.3	20.7	22.2	24.0
	7	5.1	5.4	5.7	6.1	8.3	9.3	10.3	12.5	13.6	14.9	17.7	19.1	20.5
	8	4.5	4.7	5.0	5.3	7.3	8.1	9.0	10.9	11.9	13.0	15.5	16.7	18.0
	9	4.0	4.2	4.5	4.7	6.5	7.2	8.0	9.7	10.6	11.6	13.8	14.8	16.0
	10	3.6	3.8	4.0	4.3	5.8	6.5	7.2	8.7	9.5	10.4	12.4	13.3	14.4
	11	—	—	—	—	5.3	5.9	6.5	7.9	8.7	9.5	11.3	12.1	13.1
	12	—	—	—	—	—	—	—	7.3	7.9	8.7	10.3	11.1	12.0
	13	—	—	—	—	—	—	—	6.7	7.3	8.0	9.5	10.3	11.1
	14	—	—	—	—	—	—	—	6.2	6.8	7.4	8.9	9.5	10.3
	15	—	—	—	—	—	—	—	—	—	—	8.3	8.9	9.6
	16	—	—	—	—	—	—	—	—	—	—	7.7	8.3	9.0
	17	—	—	—	—	—	—	—	—	—	—	—	—	—
	18	—	—	—	—	—	—	—	—	—	—	—	—	—
	19	—	—	—	—	—	—	—	—	—	—	—	—	—
	20	—	—	—	—	—	—	—	—	—	—	—	—	—

K.P

SPAN IN FEET	Weight per foot	8 inches deep by—				9 inches deep by—				10 inches deep by—.			
		18.4	20.5	23.0	25.5	21.8	25.0	30.0	35.0	25.4	30.0	35.0	40.0
	4	42.7	45.2	48.2	51.1	56.6	60.9	67.6	74.2	73.3	80.1	87.5	94.8
	5	34.1	36.1	38.5	40.9	45.3	48.7	54.1	59.4	58.6	64.1	70.0	75.8
	6	28.5	30.1	32.1	34.1	37.7	40.6	45.1	49.5	48.8	53.4	58.3	63.2
	7	24.4	25.8	27.5	29.2	32.3	34.8	38.6	42.4	41.9	45.8	50.0	59.2
	8	21.3	22.6	24.1	25.5	28.3	30.5	33.8	37.1	36.6	40.1	43.7	47.4
	9	19.0	20.1	21.4	22.7	25.2	27.1	30.0	33.0	32.6	35.6	38.9	42.1
	10	17.1	18.1	19.3	20.4	22.6	24.4	27.0	29.7	29.3	32.0	35.0	37.9
	11	15.5	16.4	17.5	18.6	20.6	22.2	24.6	27.0	26.6	29.1	31.8	34.5
	12	14.2	15.1	16.1	17.0	18.9	20.3	22.5	24.7	24.4	26.7	29.2	31.6
	13	13.1	13.9	14.8	15.7	17.4	18.7	20.8	22.8	22.5	24.6	26.9	29.2
	14	12.2	12.9	13.8	14.6	16.2	17.4	19.3	21.2	20.9	22.9	25.0	27.1
	15	11.4	12.0	12.8	13.6	15.1	16.2	18.0	19.8	19.5	21.4	23.3	25.3
	16	10.7	11.3	12.0	12.8	14.2	15.2	16.9	18.6	18.3	20.0	21.9	23.7
	17	10.0	10.6	11.3	12.0	13.3	14.3	15.9	17.3	17.2	18.8	20.6	22.3
	18	9.5	10.0	10.7	11.4	12.6	13.3	15.0	16.5	16.3	17.8	19.4	21.1
	19	9.0	9.5	10.1	10.8	11.9	12.8	14.2	15.6	15.4	16.9	18.4	20.0
	20	8.5	9.0	9.6	10.2	11.3	12.2	13.5	14.8	14.7	16.0	17.5	19.0

Typical Cross Section



Architecture

Cross Section

Scale : 3/8 inch = 1 Foot

Key Words

Concrete footing : The lowest member of a foundation system used to spread the loads of a structure across supporting soil.

Aggregate fill: Stone,gravel, cinder, or slag used as one of the component of concrete.

Drain Tile: Placed in gravel bed to help disperse water away from the foundation wall area.

Floating Concrete slab floor: A concrete floor system typically at ground level on top of 4" of Aggregate fill.

11-8" Concrete Blocks: blocks of concrete that are precast. The standard size is 8"x 8"x 16".

Tar: Placed on the outside of concrete blocks for waterproofing.

Anchor Bolt: A threaded rod inserted in masonry construction to anchor the sill plate to the foundation.

Joists: a horizontal wood member which supports the floor or ceiling system.

Sill Plate: a horizontal wood member anchored to a masonry wall.

Sole Plate : a horizontal wood member placed on the bottom of walls and opening in walls.

Top Plate : a horizontal wood member placed at the top of walls.

Sub Floor: 5/8" or 3/4 " plywood , nailed directly to floor joists. The finished floor is attached over the sub flooring.

Studs: the vertical framing member of a wall which is usually 2"x4 " or 2"x6".

Header: a horizontal supporting member above openings; also one or more pieces of lumber supporting ends of joists; used in framing opening of stairs and chimneys.

Fascia: a vertical board nailed onto the ends of the rafters.

Box: a joist at the perimeter of a structure that runs parallel to the other floor joists.

Rafter/Ceiling joists: an inclined structural member which supports both ceiling and the roof materials .

Ridge Board: the board placed on edge at the ridge of the roof into in which the upper ends of the rafters are fastened

Sheathing: a covered material placed over walls, floors and roofs which serves as a backing for finished materials.

Insulation Board: any board suitable for insulating purposes, usually manufactured board made from vegetable fibers, such as fiberboard Insulation

Soffit Board : the under surface of a projecting structure.

Soffit Vent: placed in the soffit to allow air to flow.

Lookouts: a horizontal framing member extended from studs to the end of rafters.

Trusses: Triangular-shaped unit which supports roof leads over long spans.

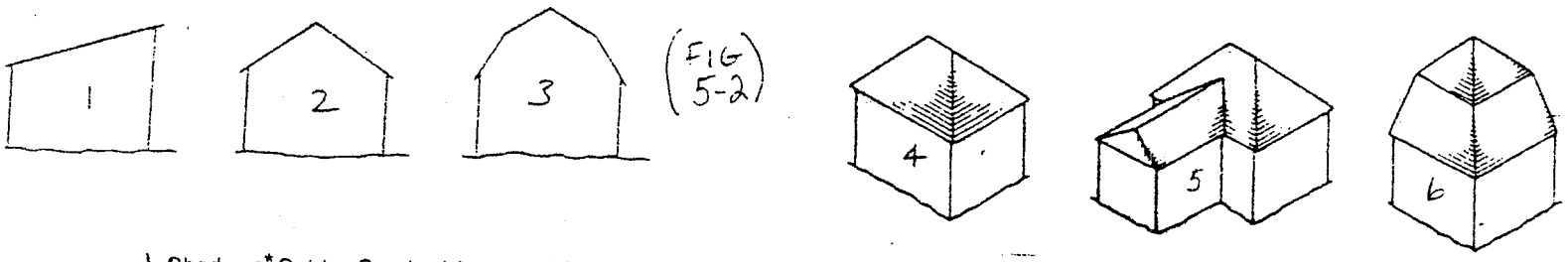
Roof Board: a covered material placed over trusses.

Overhang: The horizontal distance that a roof projects beyond a wall.

Roof Felt (Tar Paper) : a covered material placed over roof boards.

Asphalt Shingles: used to overlap each other in covering a roof.

Architecture Drawing I
Cross Section
Roof Construction



(FIG 5-2)

1 Shed 2*Gable Gambrel 3 4Hip 5Intersecting 6Mansard

* Most Common Roof Type

Maximum height two story house for Hilton 35'-0"

- Most Common Rafter Size 2" x 6"
- Most Common Truss Size 2" x 4"

Minimum Roof Slope for Hilton 4/12

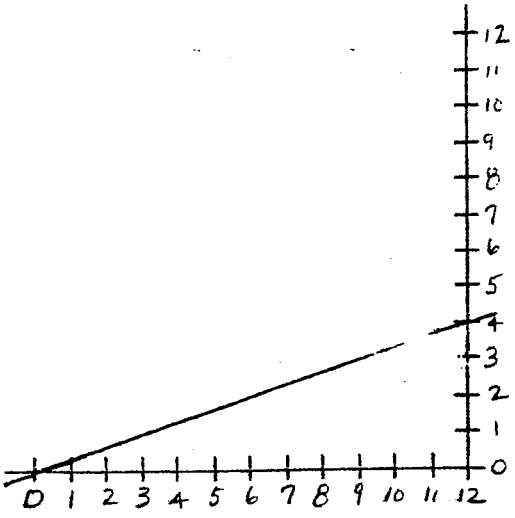
- Common Roof Slopes 5/12 -9/12

COMMON ANGLES FOR DRAWING ROOF PITCHES

Roof Pitch	Angle
1/12	
2/12	4°-30'
3/12	9°-30'
4/12	14°-0'
5/12	18°-30'
6/12	22°-30'
7/12	26°-30'
8/12	30°-0'
9/12	33°-45'
10/12	37°-0'
11/12	
12/12	45 -0'

Figure 33–9 Common roof pitches and angles. Angles shown are approximate, and are to be used for drawing purposes only.

When Plotting a roof pitch, the angle is expressed as a comparison of equal units. Units may be inches, feet, meeters, etc. as long as the horizontal and vertical units are of equal length.



The main purpose of the roof is to protect the building against the weather, but the roof may also be an architectural feature which gives the building a desired appearance.

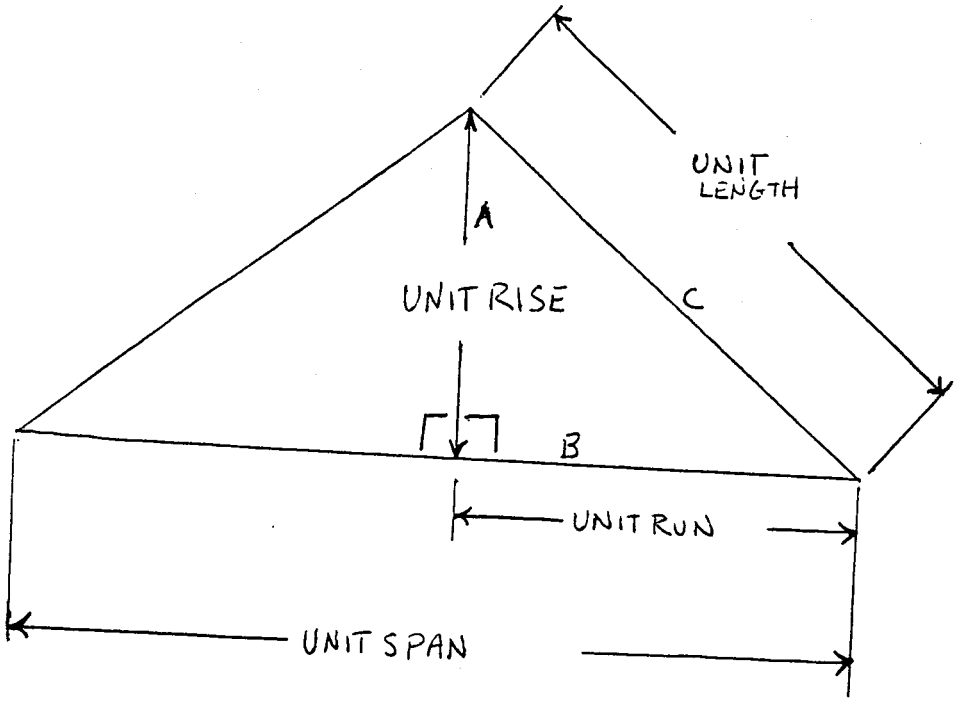
Layout and cutting of rafters requires the use of the steel square and some knowledge of geometry and trade mathematics. Ability to visualize inclined planes and the location of various types of rafters is also necessary (see Fig. 5-1). Carpenters who become proficient in rafter layout are respected by others in the trade and often earn a premium.

TYPES OF ROOFS

There are several types of roofs that the carpenter may be called upon to lay out and build (see Fig. 5-2). The shed roof is a simple design which slopes in only one direction. Gable roofs slope in two directions and are perhaps the most commonly used. All the rafters in a gable roof are identical and are called common rafters.

The hip roof gets its name from the "hips" at each corner of the building. This roof slopes in four directions and, when placed on a rectangular building, will contain some common

Examples:



STEP

1. PICK SLOPE YOU WANT FOR YOUR ROOF 4/12 TO 9/12
2. WRITE IN SPAN (WIDTH) OF YOUR HOUSE
3. DIVIDE THE SPAN BY 2 = UNIT RUN
4. UNIT RUN X SLOPE X/Y = UNIT RISE
5. CONVERT DECIMAL INTO INCHES MAKE ANSWER FEET AND INCHES.

EXAMPLE

STEP

OPE 5/12 1.
IITSPAN 30'-0" 2.
IIT RUN 15'-0" 3.

UNIT RUN x SLOPE = UNIT RISE

$15 \times \frac{5}{12} = \frac{75}{12}$ $12\overline{)75}\ 6.25$

∴ UNIT RISE = 6.25 = 6'-3"

5

- FIND UNIT LENGTH PLUS OVERHANG 1'-0"

RAFTER LENGTH, LINE LENGTH (UNIT LENGTH)

Pythagore THEORY

$A^2 + B^2 = C^2$

$(6.25)^2 + (15)^2 = C^2$

$39.06 + 225 = C^2$

$264.06 = C^2$

$\sqrt{264.06} = C$

$16.25 = C$

CONVERT TO Feet and INCHES

$C = 16'-3"$

ADD OVERHANG

$16'-3" + 1'-0"$

$16'-15" = 17'-3"$

INCLUDING 1'-0" Overhang

Name_____

Roof Construction Work Sheet

Widths of your house are the following:

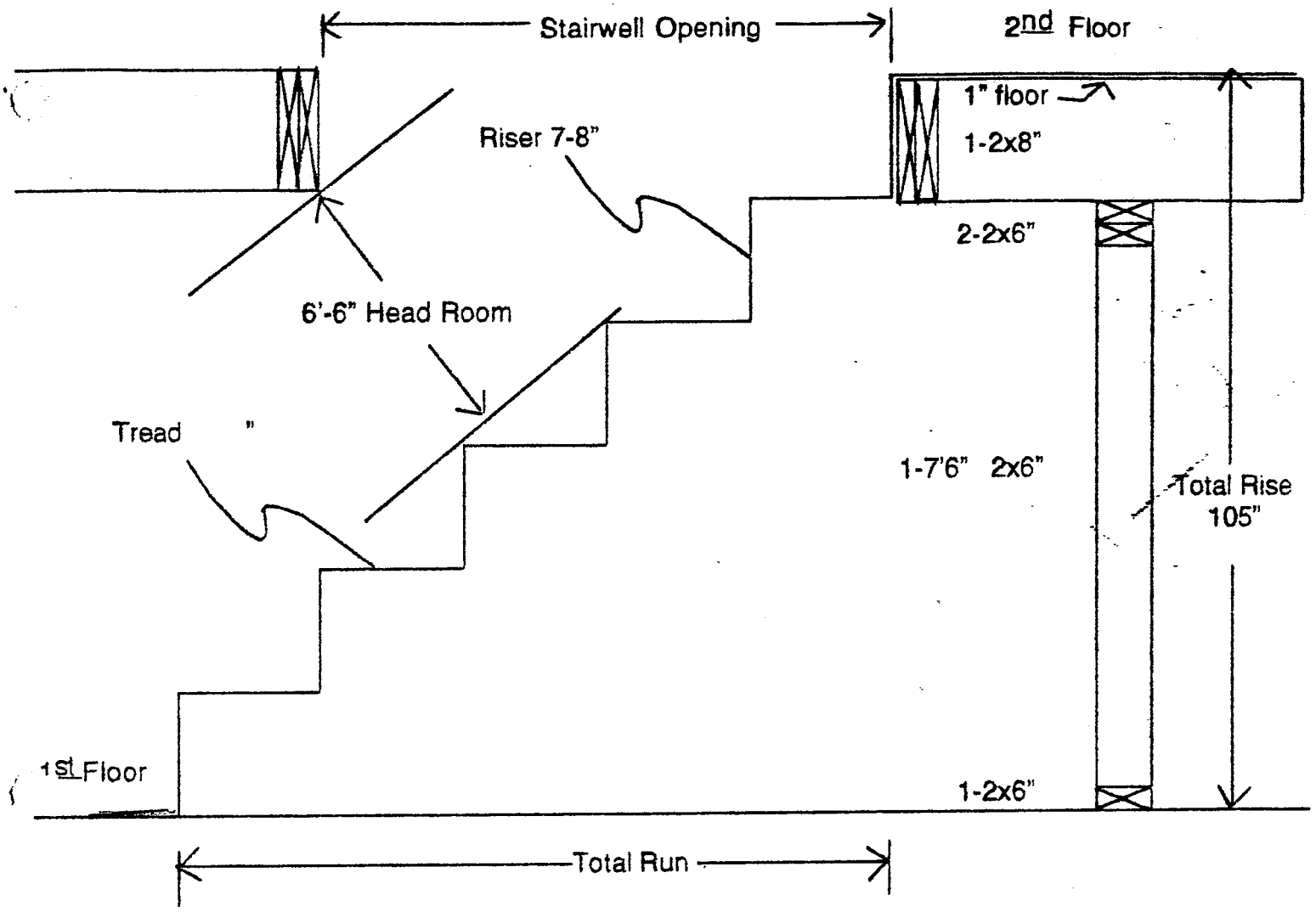
* Note Use at least three different slopes

A. 24'-0"
B. 30'-0"
C. 40'-0"
D. 46'-6"
E. 28'-9"

Calculate the following for each width
1. Slope
2. Unit Rise
3. Unit Run
4. Unit Length
5. Unit Length (Rafter) plus 1"-0" overhang

A. 24'-0"	B. 30'-0"	C. 40'-0"	D. 46'-6"	E. 28'-9"
1.	1.	1.	1.	1.
2.	2.	2.	2.	2.
3.	3.	3.	3.	3.
4.	4.	4.	4.	4.
5.	5.	5.	5.	5.

Stairs



- Total Rise = 105

1. Total Rise ÷ Riser height = # of Risers — 105" ÷ 7" = 15 Risers
2. Number of Risers minus one = # of treads — 15 Risers - 1 = 14 Treads
3. Tread width = Width of stairway opening — 3 feet = Tread width
4. LENGTH OF OPENING = Tread SIZE × # OF Treads