

Square the Layout: teacher script

Carpentry and framing apprentices square a full-size building layout with 3-4-5 and diagonals, find the corner that is off, and learn why running dimensions beat chained ones.

Prep: Set corners A (SW), B (SE) and D (NW) of a 24 ft x 32 ft rectangle exactly. Set corner C (NE) 2 in too far east (32 ft 2 in from D along the north line). Mark a wall line along the south side for the dimension-string task.

Teacher only: set corner C 2 in too far east (32 ft 2 in from D along the north line).

Min	Step and what to do	Ask	Listen for
0-5	Hook "Every wall, joist and tile line comes off these four corners. How do we know they are right?"	What does square mean in numbers?	Equal diagonals; 3-4-5 at each corner.
5-15	Corner check At corner A, measure 12 ft along one line and 16 ft along the other; the distance between the marks should be 20 ft.	What multiple of 3-4-5 is 12-16-20?	x 4.
15-28	Diagonals Measure A to C and B to D. Compare with the true 40 ft.	Which diagonal is long, and which corner is off?	A-C is long by about 1 5/8 in; C is the corner that moved.
28-40	Dimension strings Mark five window centers on the south wall line twice: chained (each from the last mark) and running (all from corner A).	Where do the two sets disagree most?	At the last mark: chained errors add up.
40-45	Exit ticket Individual exit ticket.		

Common misconceptions

- **Learners may think:** If the tapes say 24 and 32, it is square. **Address it:** Sides can be right while the corners are not; check diagonals.
- **Learners may think:** Small errors cancel out. **Address it:** They can add up; running dimensions from one point prevent it.

Supports

- Give a tape-reading card for eighths and sixteenths.
- Multilingual learners: label corners A, B, C, D and the words diagonal, square, chained, running on the floor.
- Mobility: the recorder role can be done seated at corner A with a clipboard.

References

- **Perkins V (CTE):** postsecondary and secondary CTE program context

Scenario sheet

Footprint 24 ft x 32 ft. Corners A (SW), B (SE), C (NE), D (NW). Long sides run east-west. Spec: diagonals equal within 1/4 in. Window centers on the south wall, from corner A: 3 ft 2 in, then four more at 6 ft 0 in spacing.

LEARNER SHEET • SQUARE THE LAYOUT

Name _____ Date _____

Check	Measured	Should be	OK?
Corner A: 12 ft / 16 ft / diagonal		20 ft	
Diagonal A-C		40 ft	
Diagonal B-D		40 ft	
Difference		1/4 in or less	
Corner to move, direction			

Window marks

Mark	Chained (from last mark)	Running (from A)	Difference
1			
2			
3			
4			
5			

Exit ticket

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1. What should the diagonals of a 24 ft x 32 ft rectangle measure?

 2. Diagonals read 40 ft 1 5/8 in and 40 ft 0 in. Square to 1/4 in?

 3. Five marks were chained, each read to the nearest 1/8 in. What is the worst-case error at the last mark?

Answer key

Check	Answer
True diagonal	40 ft 0 in
A-C as set	40'-1 5/8"
B-D as set	40'-0"
Difference	1 5/8 in: fails 1/4 in
Fix	A-C is long: C (or A) is off. North line D-C measures 32 ft 2 in: move C 2 in west.
Running marks from A	3'-2", 9'-2", 15'-2", 21'-2", 27'-2"
Chained worst case	up to 5/16 in at mark 5 if every reading rounds the same way

Exit ticket

1. What should the diagonals of a 24 ft x 32 ft rectangle measure?

Answer: 40 ft (24-32-40 is 3-4-5 x 8).

2. Diagonals read 40 ft 1 5/8 in and 40 ft 0 in. Square to 1/4 in?

Answer: No: they differ by 1 5/8 in.

3. Five marks were chained, each read to the nearest 1/8 in. What is the worst-case error at the last mark?

Answer: 5/16 in (5 x 1/16 in, if every reading rounds the same way).

Scoring: 1 point each, plus 1 for naming the bad corner on the floor. 3 or more = secure.

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