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Learn through sports

PRINTABLE · GRADES 6-8 · AGES 11–14

Long-Pass Pythagoras

How long is a pass that goes 24 yards downfield and 7 yards across? How far is it corner to corner on an NBA court? Use $a^2 + b^2 = c^2$ to measure the throws, runs and diagonals of the Riverton Comets' season.

Name _____

Date _____

PYTHAGORAS TOOLKIT

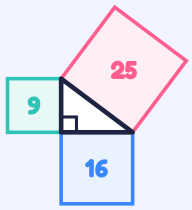
$a^2 + b^2 = c^2$
works only in a right triangle

$c = \sqrt{(a^2 + b^2)}$
find the long side (hypotenuse)

$a = \sqrt{(c^2 - b^2)}$
find a missing short side (leg)

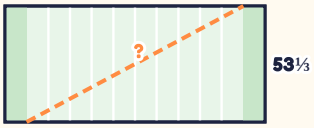
3 · 4 · 5
also 6-8-10, 9-12-15, 5-12-13

c is longest
it sits across from the right angle

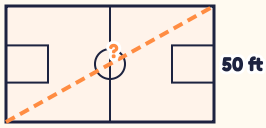


9 + 16 = 25

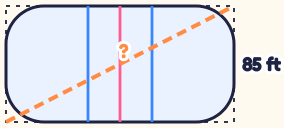
CORNER TO CORNER · REAL MEASUREMENTS



Football field
goal line to goal line



NBA court
baseline to baseline



NHL rink
dashed = if corners were square

A pass that goes **downfield** and **across** makes a right triangle. The pass itself is the **hypotenuse**.

Round to the nearest tenth unless told otherwise. Calculators are OK.

ROOKIE

1 Quarterback Theo Banks throws to a receiver **9 yd** downfield and **12 yd** to the right. How long is the pass?

WORK SPACE

_____ yd

ROOKIE

2 A deep pass travels **24 yd** downfield and **7 yd** across the field. How long is the pass?

WORK SPACE

_____ yd

STARTER

3 A coach's drill uses cones that make a triangle with sides **8**, **15** and **17 yd**. Is it a right triangle? Show why.

WORK SPACE

_____

STARTER

4 An NHL rink is **200 ft** by **85 ft**. If the corners were square, how long is the diagonal, corner to corner? (nearest tenth)

WORK SPACE

_____ ft

PRO

5 An NBA court is **94 ft** by **50 ft**. How far is it corner to corner? (nearest tenth)

WORK SPACE

_____ ft

PRO

6 A **20-yd** pass went **16 yd** downfield. How far across the field did it travel?

WORK SPACE

_____ yd

ALL-STAR

7 A football field is **100 yd** between the goal lines and **53⅓ yd** wide. Find the diagonal from goal line to goal line.

WORK SPACE

_____ yd

CHALLENGE ★

8 Challenge: A receiver runs **9 yd** downfield, cuts **12 yd** right, then runs **7 yd** more downfield. How far is he from where he started, in a straight line?

WORK SPACE

_____ yd

A The Coach's Pass Chart

Each pass is a right triangle. Find how far the ball flew, in yards (nearest tenth).

PASS	DOWNFIELD (YD)	ACROSS (YD)	PASS LENGTH (YD)
T. Banks to #11	12	5	
T. Banks to #84	20	15	
J. Ortiz to #2	10	6	
T. Banks to #19	30	16	

1. How much longer is the pass to #19 than the pass to #84?

_____ yd

2. The ball to #19 flew in a straight line. How many yards shorter is that than going **30 yd** down and then **16 yd** across?

_____ yd

B Find the Missing Side

Decide which side is missing first. Is it a leg or the hypotenuse?

1. A **26-yd** pass went **10 yd** across the field. How far downfield did it go?

WORK SPACE

a = _____ yd

2. A hockey pass travels **50 ft** and goes **14 ft** across the ice. How far up the ice did it go?

WORK SPACE

a = _____ ft

3. A sideline camera sits on a **15-ft** tower. A player stands **36 ft** from the tower's base. How long is the camera's line of sight?

WORK SPACE

c = _____ ft

C Square Corner Check

Field crews use $a^2 + b^2 = c^2$ backward: if it works, the corner is a perfect right angle.

1. Sides **20**, **21**, **29** ft. Square corner? Circle one.

YES / NO

2. Sides **10**, **24**, **27** ft. Square corner? Circle one.

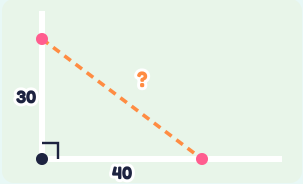
YES / NO

3. Sides **9**, **40**, **41** ft. Square corner? Circle one.

YES / NO

4. A crew measures **30 ft** along one sideline and **40 ft** along the end line. For a perfect square corner, the diagonal should be

_____ ft



THE 3-4-5 CORNER CHECK

BONUS · NOT SCORED

Measure a rectangle at home or school (a table, a rug, a doorway). Predict its diagonal with $a^2 + b^2 = c^2$, then measure it. How close were you?

Answer Key (for teachers & parents)

Answers for **Long-Pass Pythagoras**, with the work shown. Print pages 1 and 2 for students and keep this page for checking. Accept answers within a tenth from rounding. The field, court and rink sizes and the 3-4-5 layout method are real; teams and players are made up.

Page 1 Problems

1. Answer: **15 yd**
   $9^2 + 12^2 = 81 + 144 = 225$; $\sqrt{225} = 15$
2. Answer: **25 yd**
   $24^2 + 7^2 = 576 + 49 = 625$; $\sqrt{625} = 25$
3. Answer: **Yes**
   $8^2 + 15^2 = 64 + 225 = 289 = 17^2$
4. Answer: **217.3 ft**
   $200^2 + 85^2 = 40{,}000 + 7{,}225 = 47{,}225$; $\sqrt{} \approx 217.31$
5. Answer: **106.5 ft**
   $94^2 + 50^2 = 8{,}836 + 2{,}500 = 11{,}336$; $\sqrt{} \approx 106.47$
6. Answer: **12 yd**
   $20^2 - 16^2 = 400 - 256 = 144$; $\sqrt{144} = 12$
7. Answer: **113⅓ yd (≈ 113.3)**
   $100^2 + 53\frac{1}{3}^2 = 10{,}000 + 2{,}844.4 \approx 12{,}844.4$; $\sqrt{} \approx 113.3$
8. Answer: **20 yd**
   Downfield 9 + 7 = 16, across 12; $16^2 + 12^2 = 400$; $\sqrt{400} = 20$ (he ran 28)

C · Square Corner Check

1. Answer: **Yes**
   $400 + 441 = 841 = 29^2$
2. Answer: **No**
   $100 + 576 = 676$, but $27^2 = 729$
3. Answer: **Yes**
   $81 + 1{,}600 = 1{,}681 = 41^2$
4. Answer: **50 ft**
   $30^2 + 40^2 = 2{,}500$; $\sqrt{2{,}500} = 50$ (a 3-4-5 triangle × 10)

Quick score

Page 1 problems	_____ / 8
A · Pass Chart (4 boxes + 2)	_____ / 6
B · Missing Side	_____ / 3
C · Square Corners	_____ / 4
Total	_____ **/ 21**

Skills practiced

Pythagorean theorem · Converse of the theorem · Finding a missing leg · Square roots · Rounding to tenths · Distance in the plane · Real-world modeling

Teaching tip: Before #8, have students guess the straight-line distance. Many add 9 + 12 + 7 = 28. Sketch the route, then slide the two downfield runs together to show one 16-by-12 right triangle.

A · The Coach's Pass Chart

Table: Answer: **13, 25, 11.7, 34**
$\sqrt{169}$; $\sqrt{625}$; $\sqrt{136} \approx 11.66$; $\sqrt{1{,}156}$

1. Answer: **9 yd**
   $34 - 25 = 9$
2. Answer: **12 yd**
   $30 + 16 = 46$; $46 - 34 = 12$

B · Find the Missing Side

1. Answer: **a = 24 yd**
   $26^2 - 10^2 = 676 - 100 = 576$; $\sqrt{576} = 24$
2. Answer: **a = 48 ft**
   $50^2 - 14^2 = 2{,}500 - 196 = 2{,}304$; $\sqrt{2{,}304} = 48$
3. Answer: **c = 39 ft**
   $15^2 + 36^2 = 225 + 1{,}296 = 1{,}521$; $\sqrt{1{,}521} = 39$

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