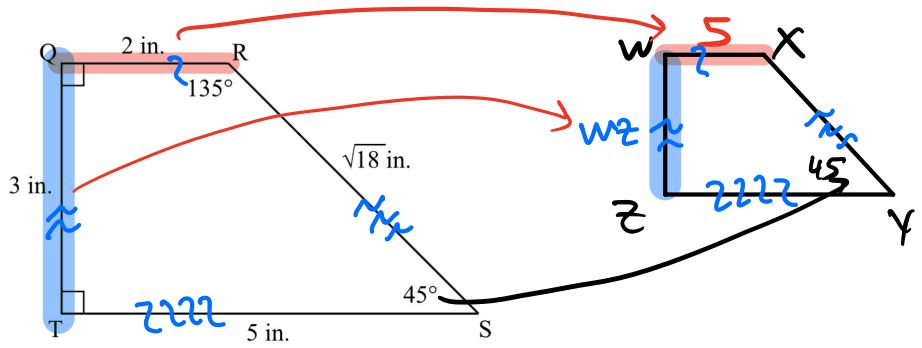
#1

Quadrilateral QRST is shown, with side lengths in inches (in.) and angle measurements in degrees.



Lynn draws quadrilateral WXYZ, which is similar to quadrilateral QRST, with WX = 5 in.

Enter values in the blank boxes to make the statement true.

Similar figures have ≅ corresponding angles.

The length of $\overline{WZ}$ is [7.5] inches and the measure of angle Y is [45°] degrees.

Scale factor Method

$2 \cdot K = 5$

$K = 2.5$

$3 \cdot K = WZ$

$3(2.5) = WZ$

$7.5 = WZ$

Proportion Method

$\frac{2}{5} = \frac{3}{WZ}$

$2WZ = 15$

$WZ = 7.5$

#2

Pre-image IMAGE

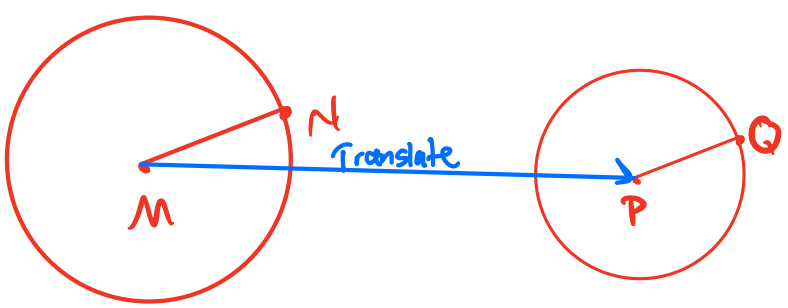
Circle M has radius MN, and Circle P has radius PQ. Points M and P are distinct points.

Select a term for each blank box to complete the statements describing how to prove that the circles are similar.

Translate the center of circle M onto point [P]

Then dilate the image of circle M about its center by a scale factor of [PQ / MN]

Because this sequence of similarity transformations maps one circle onto the other, the two circles are similar.

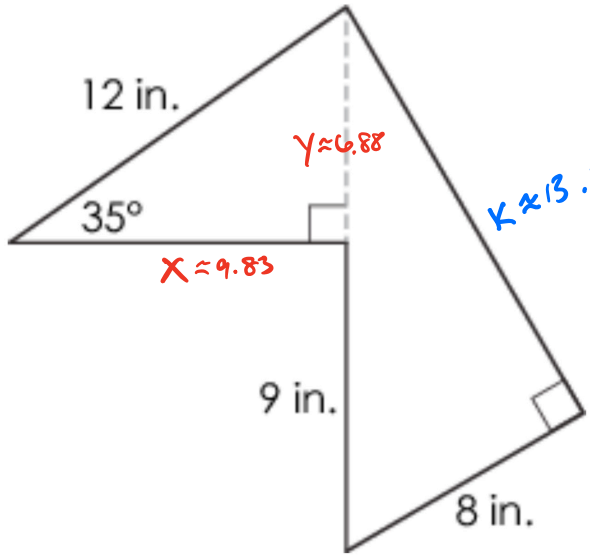


Scale factor = $\frac{\text{IMAGE}}{\text{Pre-image}} = \frac{\text{New}}{\text{OLD}}$

$= \frac{PQ}{MN}$

Kevin is creating a mosaic out of tiles. One of the tiles is shown.

#3



① $\sin(35) = \frac{y}{12}$

$12\sin(35) = y$

$6.88 \approx y$

② $\cos(35) = \frac{x}{12}$

$12\cos(35) = x$

$9.83 \approx x$

③ $8^2 + k^2 = (15.88)^2$

$k^2 = 252.1744 - 64$

$k^2 = 188.1744$

$k \approx 13.7176$

What is the perimeter of the tile, rounded to the nearest inch (in.)?

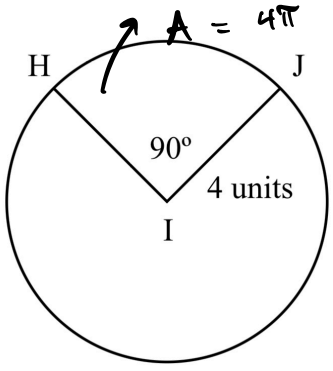
$P = 12 + 9.83 + 9 + 8 + 13.72$

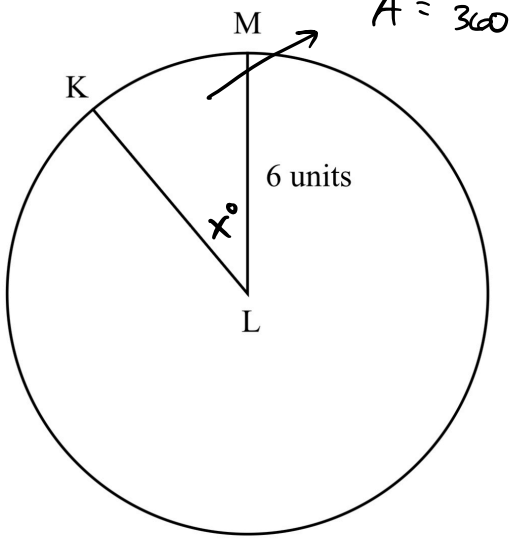
$P = 52.55$

53 in

Circles I and L are shown. Sector HIJ and sector KLM have the same area.

#4





① $A = \frac{90}{360}\pi(4)^2$

$= \frac{1}{4}\pi \cdot 16$

$A = 4\pi$

② $A = \frac{x}{360}\pi(6)^2 = \frac{x}{360}\pi 36$

$= \frac{x}{10}\pi$

③ Same Area

$4\pi = \frac{x}{10}\pi$

$40\pi = x \cdot \pi$

$40 = x$

What is the measure, in degrees, of angle KLM?

40 degrees

Greg buys a single coffee every weekday. He determines that the probability that he will buy a coffee on a random day in a 28-day period is $\frac{20}{28}$.
Greg also looks at weather records for the 28 days and sees that the temperature was above $24\ ^\circ C$ on 7 of the 28 days.

#5

Greg determines that the probability that the temperature will be above $24\ ^\circ C$ and that he will buy a coffee is $\frac{5}{28}$.

Select a phrase and a word to complete the sentence identifying the effect of the average daily temperature when it was above $24\ ^\circ C$ and Greg purchasing a coffee on a random day in the 28-day period.

If the average daily temperature on a day is 24°C or higher, it is [Equally Likely] that Greg will buy a coffee because the two events are [INDY]

FACTS

$P(\text{coffee}) = \frac{20}{28}$

$P(\text{Above } 24^\circ C) = \frac{7}{28}$

$P(\text{coffee and above } 24^\circ C) = \frac{5}{28}$

If INDY, then . . .

$P(\text{coffee and above } 24^\circ) = P(\text{coffee}) \cdot P(\text{Above } 24^\circ C)$

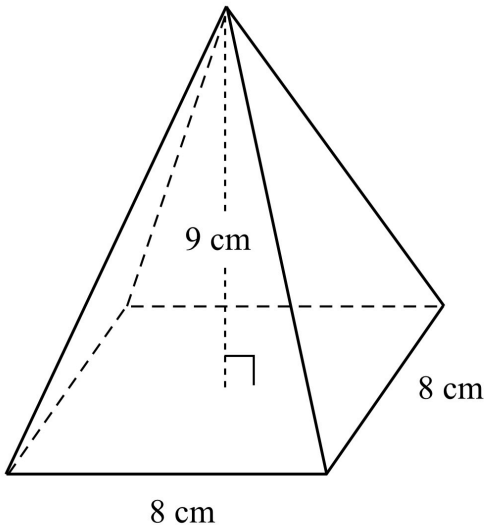
$\frac{5}{28} = \frac{20}{28} \cdot \frac{7}{28}$

$\frac{5}{28} = \frac{5}{7} \cdot \frac{1}{4}$

$\frac{5}{28} = \frac{5}{28}$ True, thus INDY!

A square pyramid is shown, with dimensions in centimeters (cm).

#6



$V = \frac{1}{3} B \cdot h$ (B = Area of base)

$V = \frac{1}{3}(64) \cdot 9$

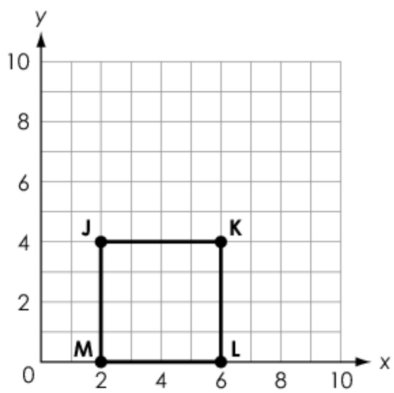
$V = 192$

$B = 8 \cdot 8$

$B = 64$

What is the volume, in cubic centimeters, of the pyramid?

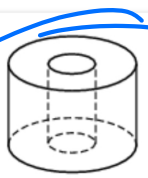
192 *cubic centimeters*

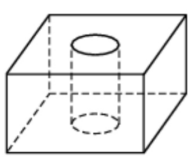


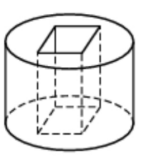
7

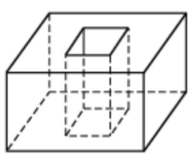
Square JKLM is shown.

Which three-dimensional figure could result from rotating square JKLM 360° clockwise about the *y*-axis?

Ⓐ 

Ⓒ 

Ⓑ 

Ⓓ 

Westville has a land area of 84.4 square miles. In 2015, the population density was 22.5 people per square mile.

In 2016, the population was 2,000 people.

#8

By how many people did the population of Westville increase between 2015 and 2016?

$$\text{Density} = \frac{\text{people}}{\text{mile}^2}$$

2015

$$22.5 = \frac{\text{People}}{84.4}$$

$$1899 = \text{people}$$

2016

People 2,000

101 people

A company surveys people in a city to find the type of cell phone plans they have and which provider they use. The results are shown in the table.

#9

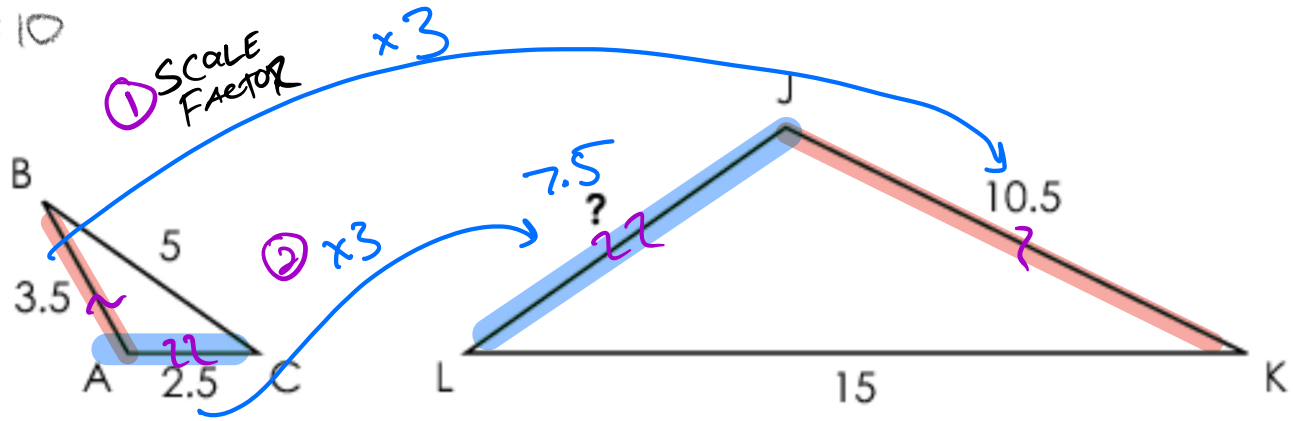
	Unlimited Usage	Limited Usage	Total
Provider A	19	4	23
Provider B	14	6	20
Provider C	13	11	24
Other	7	1	8
Total	53	22	75

What is the probability that a randomly selected person who has a plan with Provider B has unlimited usage?

$$P(\text{unlimited} \mid \text{Provider B}) = \frac{14}{20}$$

Two similar triangles, $\triangle ABC$ and $\triangle JKL$, are shown.

#10



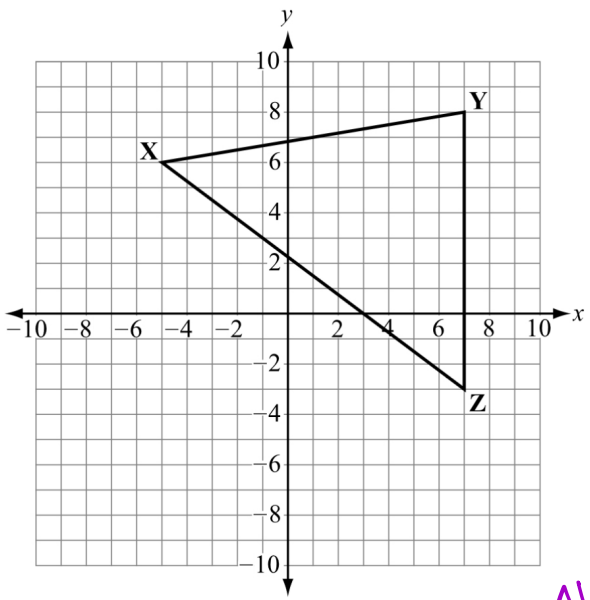
What is the length of side JL? 7.5

OR USE Proportion

$$\frac{3.5}{10.5} = \frac{2.5}{JL}$$

Triangle XYZ is shown.

#11



Always dilation

Which transformation on $\triangle XYZ$ results in a triangle that is similar but not congruent, to $\triangle XYZ$?

(A) a translation 3 units to the right

(B) a reflection across the line $y = -2x + 3$

(C) a rotation 90° clockwise around the origin

(D) a dilation centered at the origin with a scale factor of 2

The volume of a cylinder is 90 cubic centimeters. #12

B = Area of base

Which step can be performed to find the volume of a cone with the same radius and height as the cylinder?

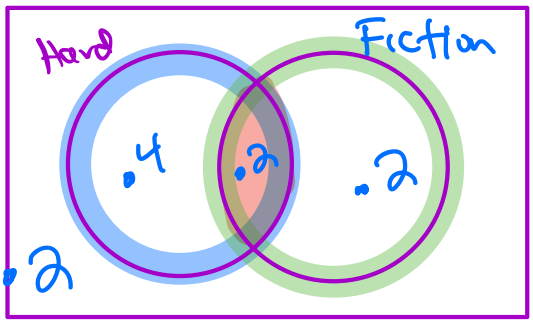
- (A) divide the volume of the cylinder by π
- (B) divide the volume of the cylinder by 3
- (C) divide the volume of the cylinder by the height
- (D) divide the volume of the cylinder by the radius

$V_{cyl} = B \cdot h$ $\quad V_{cone} = \frac{1}{3}Bh$ Divide by 3

Hernan randomly selects a book from his library. He calculates the probabilities given. #13

- $P(\text{hardcover or fiction}) = 0.8$
- $P(\text{hardcover and fiction}) = 0.2$
- $P(\text{hardcover}) = 0.6$

What is the probability that Hernan selects a fiction book? .4



OR

$P(H \text{ or } F) = P(H) + P(F) - P(H \text{ and } F)$

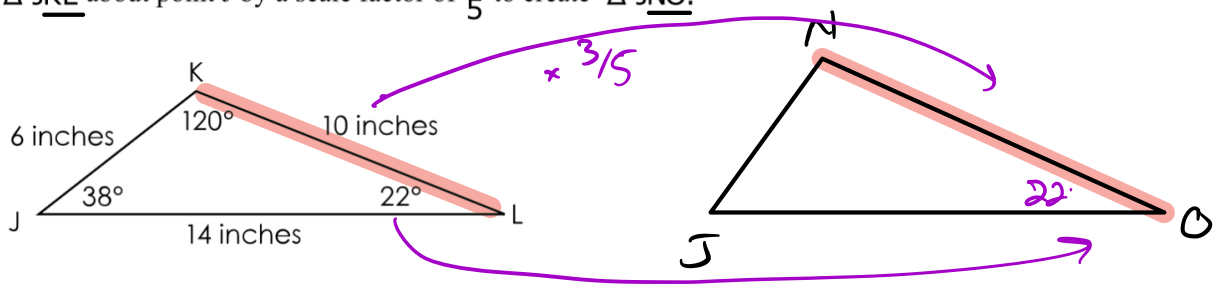
$0.8 = 0.6 + P(F) - 0.2$

$0.8 = P(F) + 0.4$

$0.4 = P(F)$

Megan dilates Δ JKL about point J by a scale factor of $\frac{3}{5}$ to create Δ JNO.

#14



What is the length, in inches, of $\overline{NO}$?

$NO =$ 6 *inches*

What is the measure, in degrees, of $\angle O$?

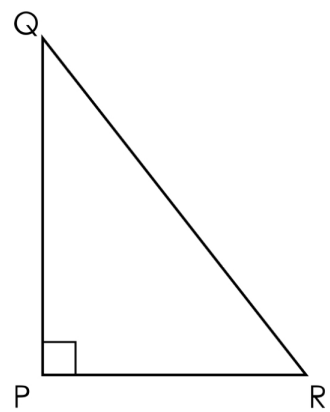
22° *degrees*

$10 \cdot \frac{3}{5} = \frac{30}{5} = 6$

Similar figures have $\cong$ corresponding angles

Right triangle PQR is shown, where m$\angle$Q is not equal to m$\angle$R.

#15



$\sin Q = \cos R$

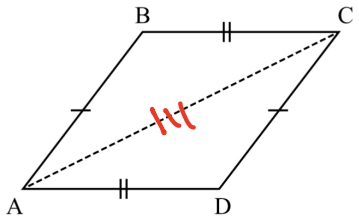
Recall If $Q + R = 90$, then $\sin Q = \cos R$

Which expression is equivalent to sin(Q)?

- (A) sin(P)
- (B) cos(P)
- (C) sin(R)
- (D) cos(R)

In quadrilateral ABCD, $\overline{AB} \cong \overline{CD}$ and $\overline{BC} \cong \overline{AD}$, as shown.

#16



Select a term for each blank box to complete the proof showing that $\Delta ABC \cong \Delta CDA$.

By the Reflexive property of congruence, we can show that $\overline{AC} \cong \overline{CA}$. Therefore, it can be established that $\Delta ABC \cong \Delta CDA$ by the SSS congruence theorem.

#17

Events Q and R are independent events, such that $\frac{P(Q \cap R)}{P(R)} = \frac{4}{5}$.

Which probability is equal to $\frac{4}{5}$?

$P(Q \cap R) = P(Q) \cdot P(R)$

$P(Q \cap R) = \frac{4}{5} \cdot P(R)$

(A) $P(Q)$

(B) $P(R)$

(C) $P(Q \cup R)$

(D) $P(Q \cap R)$

#8

Gus is designing a cylinder to ship liquids using the constraints given.

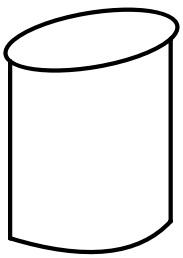
- The inside of the cylinder must hold from 475 to 480 cubic centimeters of liquid.
- The diameter must be at least 8 centimeters and at most 10 centimeters.

What are a possible radius and corresponding height, in centimeters, for the inside of a cylinder that meets the constraints? Round the answers to the nearest tenth.

Radius: 4.5 *centimeters*

Height: 7.5 *centimeters*

B = Area of base



① V = 475 to 480 → I choose 477

d = 8 to 10

so r = 4 to 5

↳ I choose 4.5

② $V = B \cdot h$

$V = \pi r^2 \cdot h$

$477 = \pi (4.5)^2 \cdot h$

$\frac{477}{(4.5)^2 \pi} = h$

$7.5 \approx h$

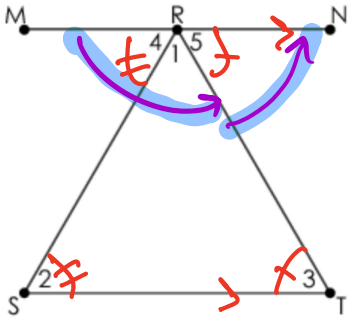
③ Check answer

$V = \pi (4.5)^2 \cdot 7.5$

$V \approx 477$ ✓

In the figure shown, $\overline{MN} \parallel \overline{ST}$.

#19



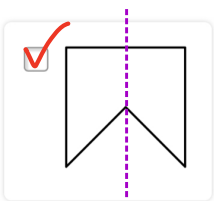
Move statements and reasons into the blank boxes to complete the proof that $m\angle 1 + m\angle 2 + m\angle 3 = 180°$.

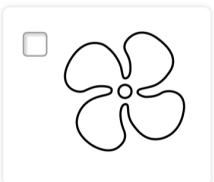
Statements	Reasons
1. $\overline{MN} \parallel \overline{ST}$	1. Given
2. $m\angle 2 = m\angle 4$ and $m\angle 3 = m\angle 5$	2. Alt. INT ∠'S ≅
3. $m\angle 4 + m\angle 1 = m\angle MRT$	3. Angle addition postulate
4. m∠MRT + m∠5 = 180	4. LINEAR PAIR Th'm
5. $m\angle 1 + m\angle 4 + m\angle 5 = 180°$	5. Substitution
6. m∠1 + m∠2 + m∠3 = 180°	6. Substitution

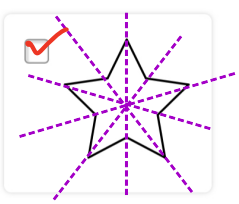
$m\angle 1 + m\angle 2 + m\angle 3 = 180°$ | $m\angle MRT + m\angle 5 = 180°$ | $m\angle MRT + m\angle 2 = 180°$ | Linear pair theorem | Definition of complementary angles | Vertical angles are congruent. | Alternate exterior angles are congruent. | Alternate interior angles are congruent.

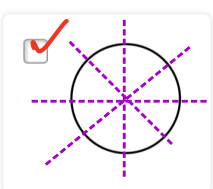
20

Select all of the figures that appear to have at least one line of symmetry.

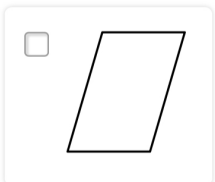


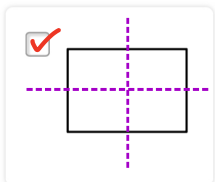






INFINITE #





Janet draws triangle PQR with vertices P (1, 1), Q (–2, 4), and R (1, 7). She claims that the triangle is an isosceles right triangle.

#21

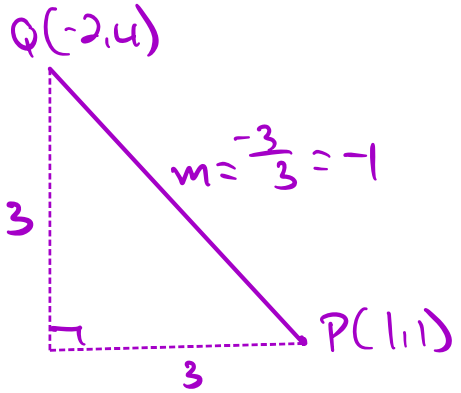
Which statement shows that Janet is correct?

Ⓐ The slope of $\overline{PQ}$ is 1, which is the reciprocal of the slope of $\overline{QR}$, and PQ and QR are equal to $\sqrt{6}$.

Ⓑ The slope of $\overline{PQ}$ is 1, which is the reciprocal of the slope of $\overline{QR}$, and PQ and QR are equal to $3\sqrt{2}$.

Ⓒ The slope of $\overline{PQ}$ is –1, which is the negative reciprocal of the slope of $\overline{QR}$, and PQ and QR are equal to $\sqrt{6}$.

Ⓓ The slope of $\overline{PQ}$ is –1, which is the negative reciprocal of the slope of $\overline{QR}$, and PQ and QR are equal to $3\sqrt{2}$. = 4.24



$3^2 + 3^2 = QP^2$

$18 = QP^2$

$\sqrt{18} = QP$

4.24