

LESSON 3 – GEOMETRY

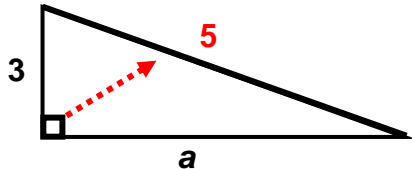
A) THE PYTHAGOREAN THEOREM

The Pythagorean Theorem is used to find the missing side of a **right** triangle. Remember, the longest side “c” is always across from the _____ angle.

The Pythagorean Theorem:

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

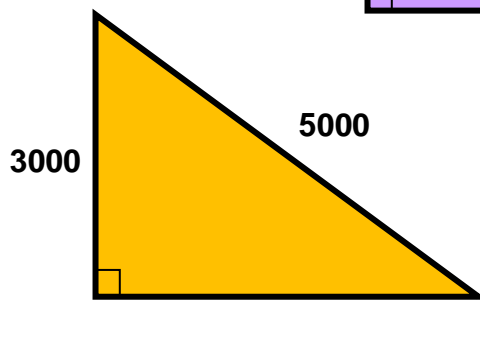
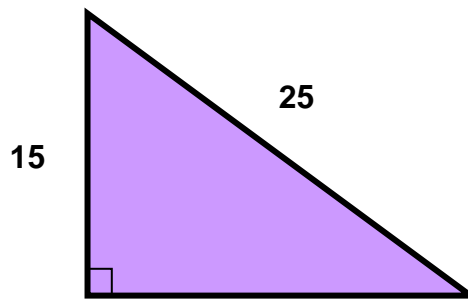
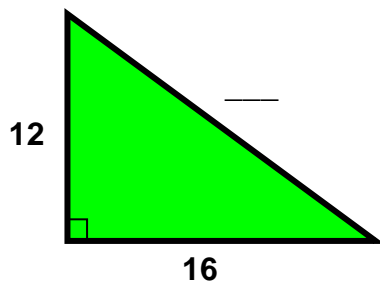
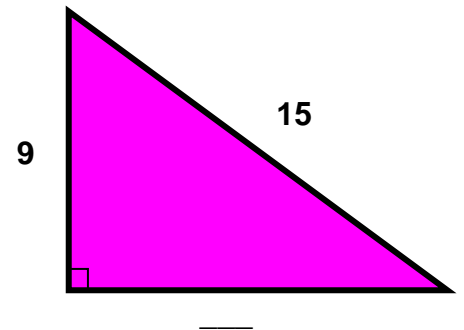
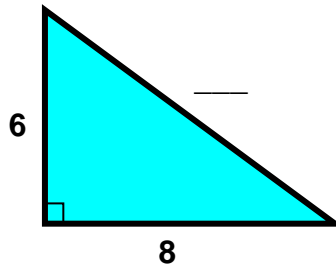
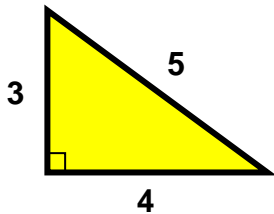
Ex. Find a.



$$a^2 + 3^2 = 5^2$$

$$a^2 +$$

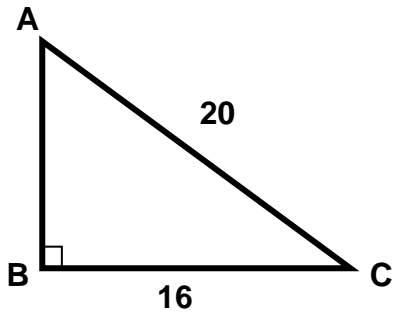
This is a “special” case where you can just use multiples: **3 – 4 – 5**
If you are lucky enough to get a triangle made up of these multiples, then you can do the problem in your head!



3 – 4 – 5

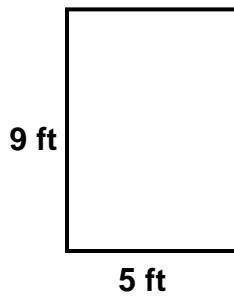
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1) Find the length of AB in the right triangle below.



2) What is the length of a diagonal of a rectangle of length 30 and width 40?

- a) 38 b) 45 c) 48 d) 50 e) 52

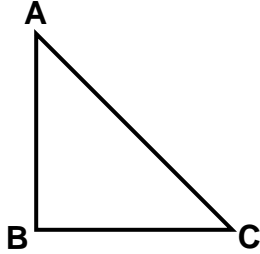


3) What is the length of a diagonal in the rectangle above?

- a) 10.3 b) 10.8 c) 11.2 d) 11.5 e) 12

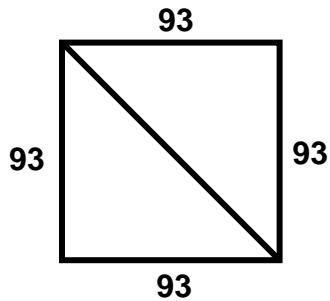
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4) In right triangle ABC, AB = 20 and BC = 20. Approximately how long is AC?



- a) 20 b) 24 c) 26 d) 28 e) 30

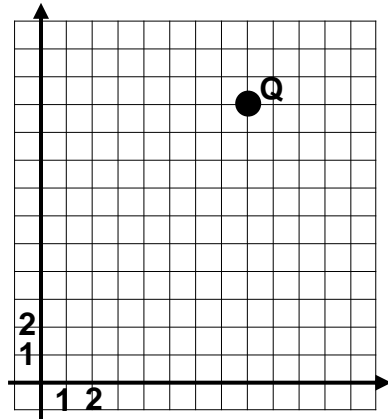
Shortcut: If the 2 legs of a right triangle are the same, the hypotenuse will ALWAYS be equal to a leg times $\sqrt{2}$.



5) What is the length of the diagonal in the square above?

- a) 93 b) $93\sqrt{2}$ c) $93\sqrt{3}$ d) 186 e) $186\sqrt{2}$

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6) What is the distance of point Q from the origin?

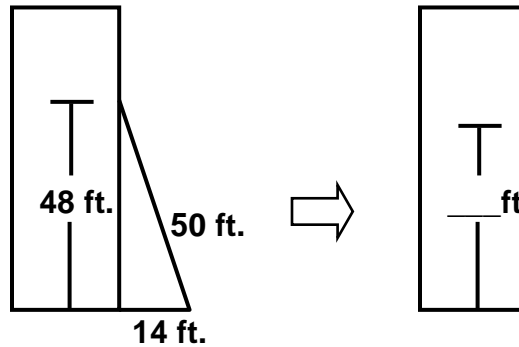
a) $2\sqrt{13}$

b) $5\sqrt{17}$

c) $3\sqrt{11}$

d) $5\sqrt{37}$

e) $2\sqrt{41}$

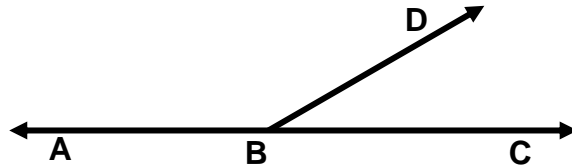


7) A 50 ft. ladder is leaning up against a wall as shown in the drawing above. If the ladder slips down the wall 8 feet, how much further will the base of the ladder now be from the wall?

B) ANGLE & TRIANGLE RELATIONSHIPS

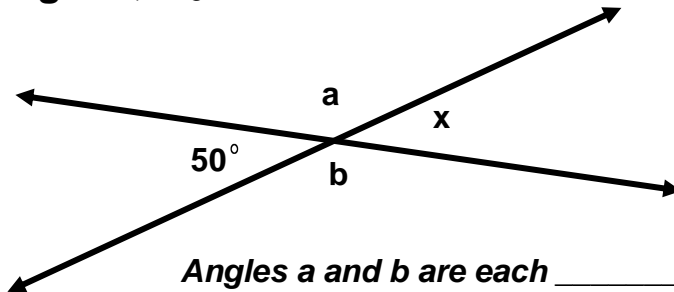
The sum of the angles of a triangle is ALWAYS _____.

Angles that form a straight line have a sum of _____°



If $\angle ABD = 120^\circ$, then $\angle DBC =$ _____?

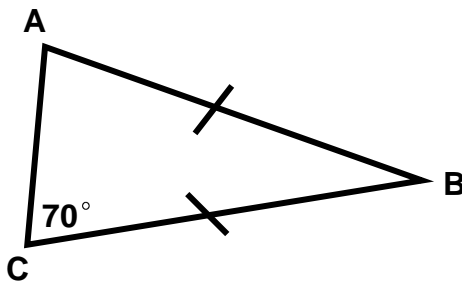
Vertical angles (straight across from each other when two lines intersect) **are equal.**



$x =$ _____

Angles *a* and *b* are each _____°

If 2 sides of a triangle are equal, then the _____ opposite those sides are also equal.

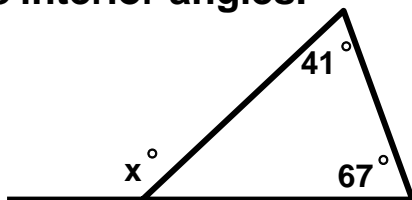


Angle B = _____

Angle A = _____



An exterior angle of a triangle is equal to the sum of the two *remote* interior angles.



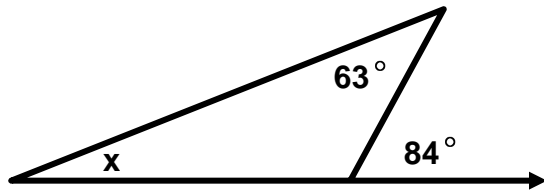
$x =$ _____

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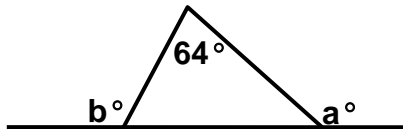
1) Which of the following could be the measures of angles of a triangle?

- a) $20^\circ, 25^\circ, 140^\circ$ b) $50^\circ, 60^\circ, 75^\circ$ c) $20^\circ, 80^\circ, 80^\circ$
d) $100^\circ, 45^\circ, 45^\circ$ e) $35^\circ, 55^\circ, 85^\circ$

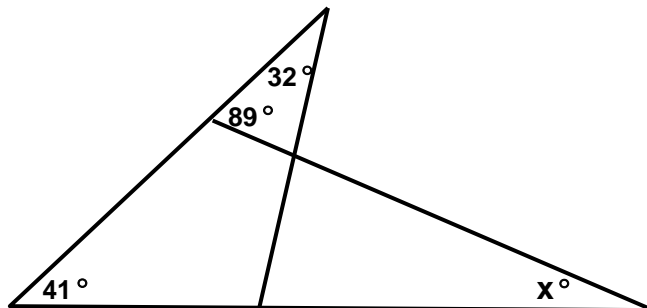
2) Find the measure of x in the picture below:



- a) 21° b) 31° c) 117° d) 96° e) 147°



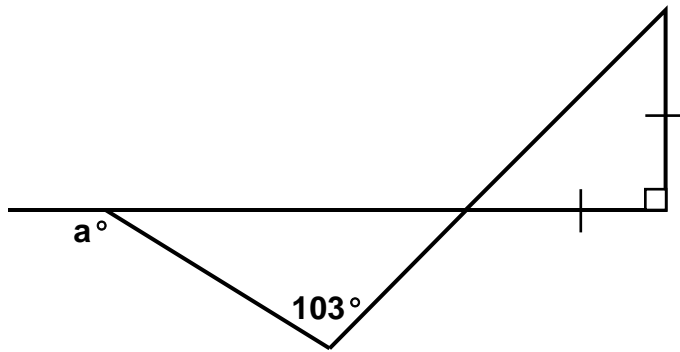
3) In the diagram above, if $a = 115$ degrees, what is b ?



4) What is the value of x in the picture above?

- a) 37 b) 48 c) 51 d) 54 e) 61

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5) What is the value of a in the picture above?

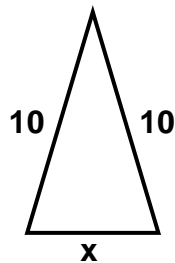
- a) 32 b) 45 c) 59 d) 121 e) 148

THE TRIANGLE INEQUALITY:

Given the lengths of 2 sides of a triangle, the 3rd side must be between the difference and the sum of the 2 sides.

6) A triangle has sides of lengths 5, 8, and x . Which of the following could be the value of x ? Indicate all such values.

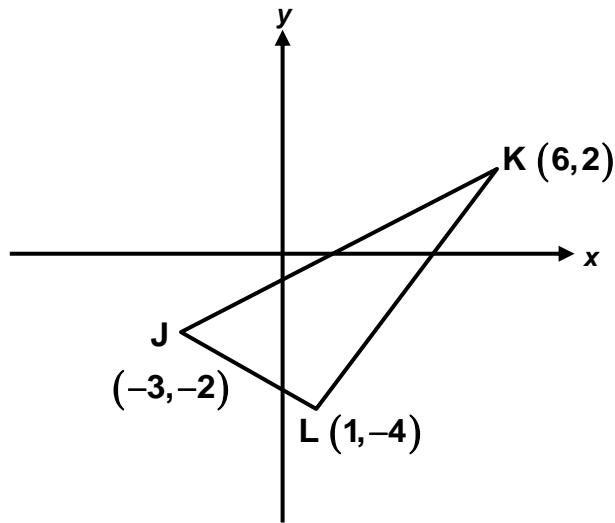
- a) 2.9 b) 4.5 c) 6.25 d) 7 e) 13



7) In the triangle above, x could be any number except:

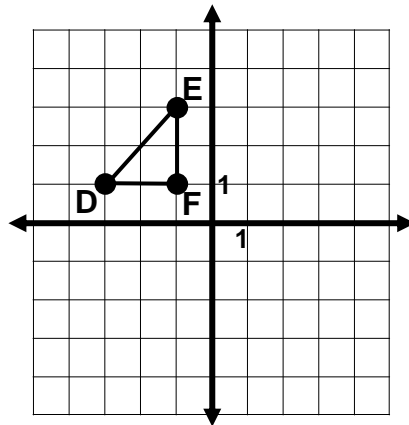
- a) 1 b) 7 c) 11 d) 16 e) 20

C) TRANSFORMATIONS



1) If triangle *JKL* in the *xy*-plane shown above is shifted 7 units to the right and 4 units up, what would be the coordinates of point L after the shift?

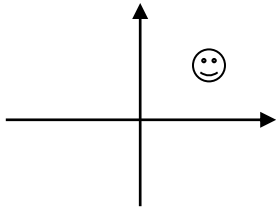
- a) (-6, -8) b) (3, -3) c) (6, 2) d) (0, 8) e) (8, 0)



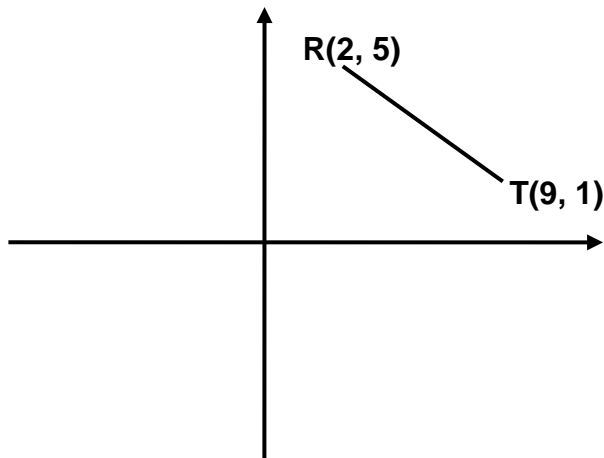
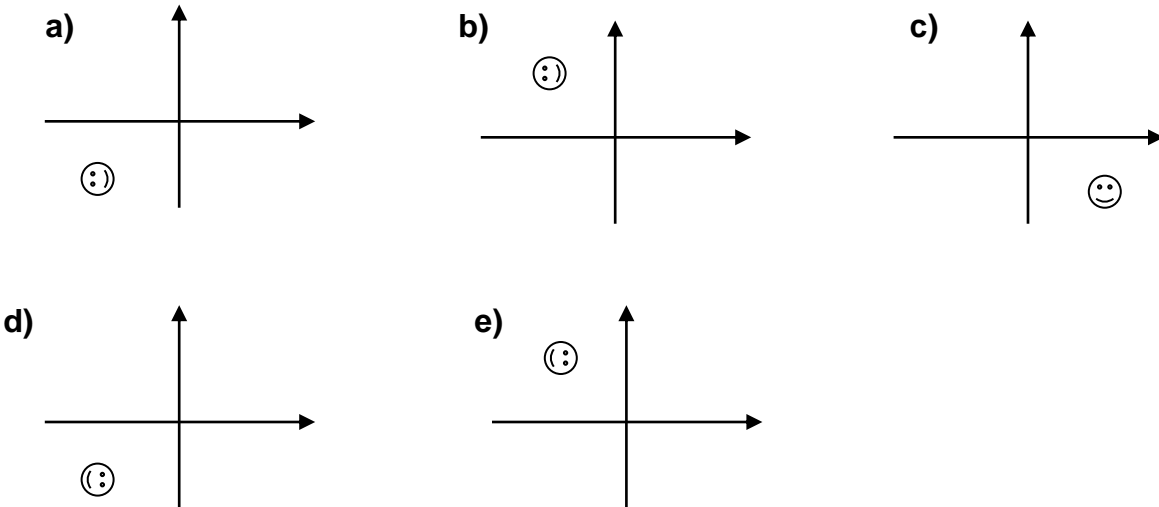
2) Triangle *DEF* in the *xy*-plane above will be translated 3 units to the right and then 2 units down. What point will correspond to vertex E after these translations?

- a) (2, 1) b) (1, 2) c) (-2, 1) d) (1, -2) e) (-2, -1)

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3) Which of the following graphs shows a 90 degree counter-clockwise rotation of the figure above followed by a reflection over the x-axis?



4) If the segment RT is reflected across the x-axis to the new coordinates $R'T'$, which of the following could be the coordinates of R' and T' ?

***R' is read "R prime" and it means the new R.
 T' is read "T prime" and it means the new T.***

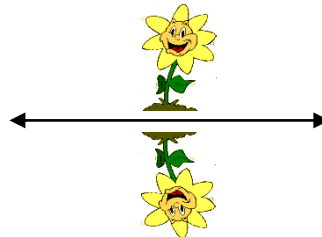
- a) $(-2, 5)(-9, 1)$ b) $(-2, -5)(-9, -1)$ c) $(2, -5)(9, -1)$
- d) $(5, 2)(1, 9)$ e) $(-2, -5)(9, 1)$

TYPES OF TRANSFORMATIONS:

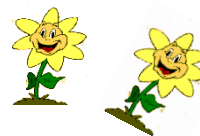
A translation is a _____.



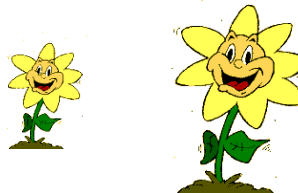
A reflection is a _____ over a line.



A rotation is a _____ about a point.



A dilation will _____ the size.



A reduction will _____ the size.



5) If \overline{AB} is mapped to $\overline{A'B'}$ so that $AB = A'B'$, which of the following is a possible transformation? Choose all that apply.

- a) A 180° clock-wise rotation of \overline{AB} about the origin.
- b) A dilation of \overline{AB} of scale 3.
- c) A reduction of \overline{AB} of scale 3.
- d) A translation of \overline{AB} two units to the right and 7 units down.
- e) A reflection of \overline{AB} across the x-axis.

D) CIRCLES

A radius is equal to the distance from the center to any point on the circle.
 A diameter is the distance across a circle through the center.
 A radius = $\frac{1}{2}$ of a diameter. A diameter = 2 x radius.
 There are 360 degrees in a circle.

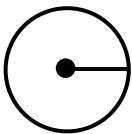
The distance “around” a circle is the Circumference = (diameter) π

Length of an arc: $\frac{\text{number of degrees in the arc}}{360} \cdot d\pi$

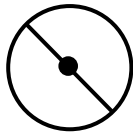
Area of a circle = π (radius)²

Area of a sector of a circle: $\frac{\text{number of degrees in the arc}}{360} \cdot \pi r^2$

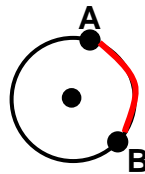
radius



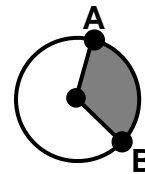
diameter



arc



sector



- 1) A large wheel has a diameter of 30 inches, and a small wheel has a diameter of 20 inches. How many revolutions does the small wheel need to make to travel the same distance that the large wheel travels in 240 revolutions?
- a) 160 b) 240 c) 320 d) 360 e) 420

Hint: 1 revolution = 1 circumference

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2) If the circumference of a circle is 96 feet, which of the following is closest to the area of the circle?

- a) 610 b) 735 c) 2900 d) 3800 e) 4700

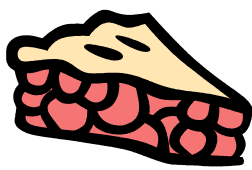
3) Harry wants to make a circle graph. He budgets \$150 out of his paycheck of \$450 for food. How many degrees should be in the interior angle (also called the “central angle”) for food?

- A) 30 B) 60 C) 90 D) 120 E) 200

Directions: Figure out what fraction of the total is spent on food. Then write a proportion comparing this fraction to _____degrees in a circle!

4) Dawn wants to put a circular rug onto the floor that is a rectangle with dimensions 12 ft. by 14 ft. What is the area of the largest rug that will fit into the room?

- a) 15π b) 36π c) 49π d) 75π e) 225π

Area =  R

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5) In a circle graph a sector of 100 degrees represents an investment of 25 million dollars. What is the value of the total investment?

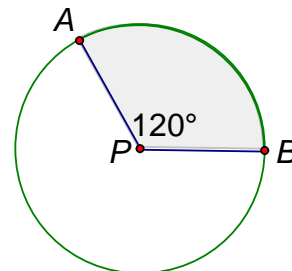
- a) 100 million
- b) 85 million
- c) 75 million
- d) 125 million
- e) 90 million

6) In a circle graph a sector of 100 degrees represents the amount a company spent on employee salaries. If the entire budget of the company is 25 million, how much was spent on employee salaries?

- a) 6.94 million
- b) 8.72 million
- c) 15.48 million
- d) 11.35 million
- e) 20.25 million

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7) The area of the shaded sector shown is 75π .
What is the circumference of the circle?



a) 15

b) 12π

c) 24

d) 24π

e) 30π

Area of a sector =

Circumference =



E) AREA & VOLUME

FORMULAS FOR AREA

RECTANGLE 

The area of a rectangle = length • width

SQUARE 

The area of a square = (length • width) or (side)²

TRIANGLE 

The area of a triangle = $\frac{1}{2}$ base • height

PARALLELOGRAM 

The area of a parallelogram = base • height

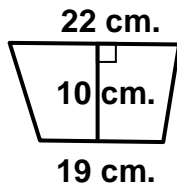
RHOMBUS 

The area of a rhombus = base • height
or $\frac{1}{2}$ (diagonal₁ • diagonal₂)

TRAPEZOID 

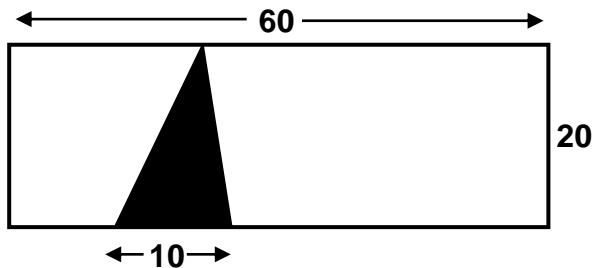
The area of a trapezoid = $\frac{1}{2}$ (base₁+base₂) height

1) What is the area of the trapezoid shown below?

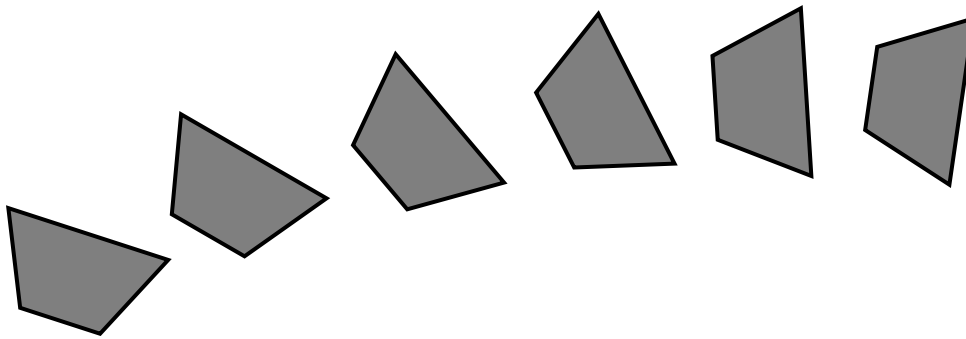


- a) 195 b) 200 c) 205 d) 219 e) 215

2) What is the area of the shaded triangle in the rectangle below?



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- 3) A garden path is made up of six congruent trapezoidal stepping stones as shown above. Each stone has bases of 8 in. and 10 in. and heights of 6 in. Find the total area of the stones.



- 4) Buddy is getting ready to roll his lawn with the lawn roller shown above. The diameter of the roller is a half of a foot. Approximately how many square feet will the roller cover in two rotations?

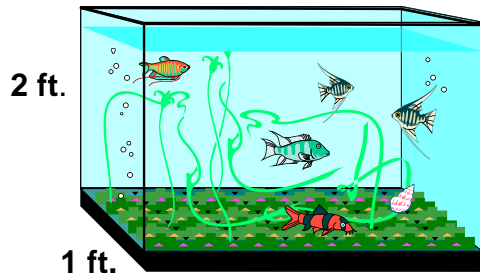
- a) 4.71 b) 9.42 c) 10.03 d) 10.92 e) 15.5

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VOLUME OF A RECTANGULAR SOLID (aka box)

$$V = L \cdot W \cdot H$$

- 1) An aquarium tank has a volume of 10 cubic feet. If it is 1 foot wide, and 2 feet high, what is its length?



- a) 4 b) 5 c) 18 d) 30 e) 32

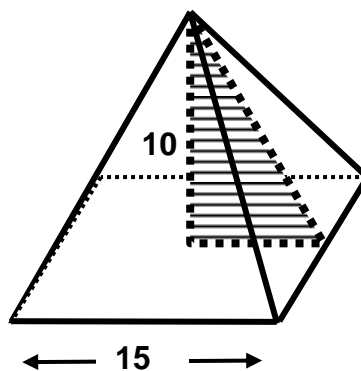
- 2) A driveway is 40 feet by 6 feet by 1/18 feet. How much concrete would be needed to fill the driveway?

- a) 4,320 cu. ft. b) 1,240 cu. ft. c) 20.7 cu. ft.
d) 13.3 cu. ft. e) 9.7 cu. ft.

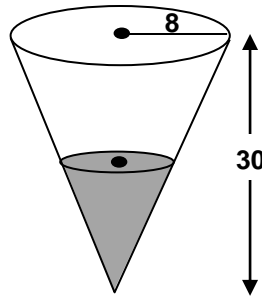
- 3) The formula for volume of a pyramid is:

$$V = \frac{1}{3}Bh \text{ where } B \text{ represents the area of the base and } h \text{ represents the height.}$$

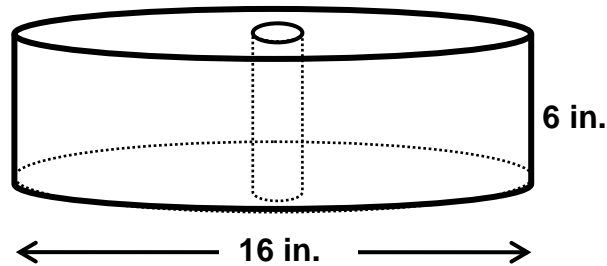
Find the volume of this square pyramid:



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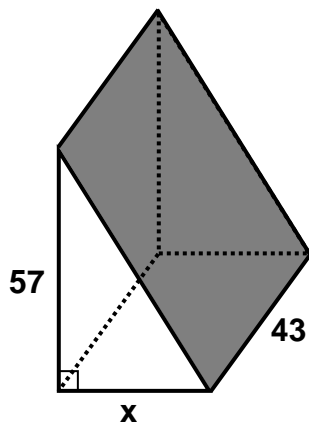
- 4) The figure above shows a right circular cone with base radius 8 and height 30. The shaded portion of the figure is a right circular cone with height 15. The volume of the smaller cone is what fraction of the volume of the larger cone? (The volume of a right circular cone with base radius r and height h is $\frac{1}{3}\pi r^2 h$.)



- 5) The cylinder above has a hole with a 2 inch diameter cut out of the center. What is the volume of the remaining solid? $V = \pi r^2 h$

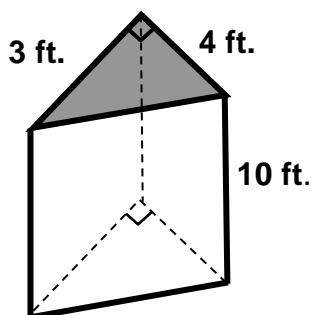
- a) 378π b) 384π c) 390π d) 398π e) 402π

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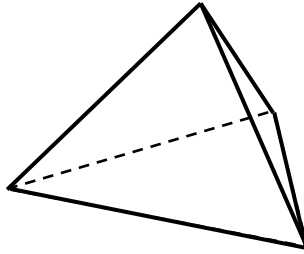


6) A right triangular prism is shown above. If the area of the shaded rectangle is 2924, what is the value of x to the nearest tenth?

7) Find the volume of the triangular prism below. The volume of a prism is $V = Bh$ where B represents the area of the base.

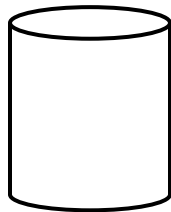


F) CROSS-SECTIONS



1) Which figure would represent a cross-section that is parallel to the base of the pyramid above?

- a) square b) rhombus c) circle d) triangle e) trapezoid



2) Which figure would represent a cross-section that is parallel to the base of the cylinder above?

- a) ellipse b) circle c) rectangle d) parabola e) trapezoid

3) Candice cuts out a “slice” of the solid with a plane parallel to the base (B), covers it with ink and then presses it to a piece of paper. Which of the following shows the shape of the ink on the paper?

