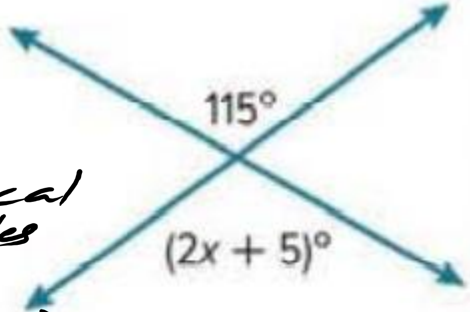
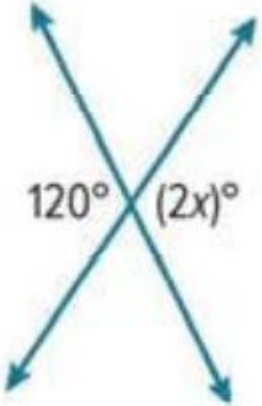
5. Write and solve an equation to find the value of x. (Example 3)



$2x+5=115$
$-5 \quad -5$
$\frac{2x}{2}=\frac{110}{2}$
$x=55$

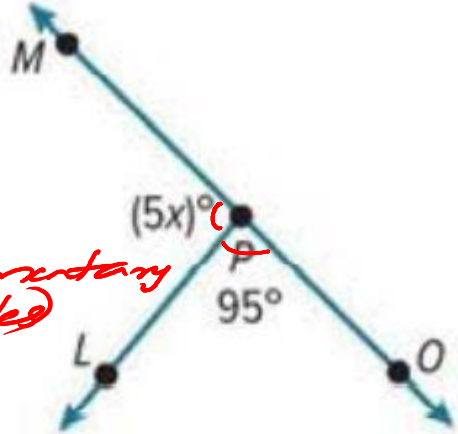
(vertical angles are equal)

6. Write and solve an equation to find the value of x. (Example 3)



$\frac{2x}{2}=\frac{120}{2}$
$x=60$

7. Write and solve an equation to find the value of x. (Example 5)

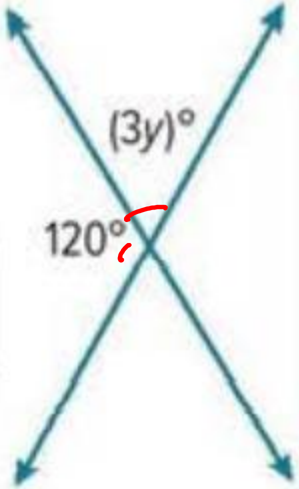


$5x+95=180°$
$-95 \quad -95$
$\frac{5x}{5}=\frac{85}{5}$
$x=17$

(Supplementary angles)

Test Practice

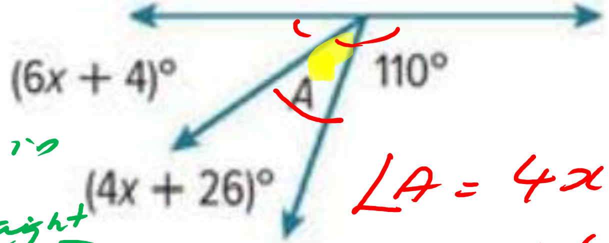
8. Open Response Write and solve an equation to find the value of y.



$3y+120=180$
$-120 \quad -120$
$3y=60$
$y=\frac{60}{3}$
$=20$

Apply

9. Levi was designing a kite. He needs to determine the measure of ∠A before cutting the fabric. What is the measure of angle A?



$6x+4+4x+26+110 = 180$ (angles in a straight line).

$10x + 140 = 180$

$10x = 180 - 140 = 40$

$x = \frac{40}{10} = 4$

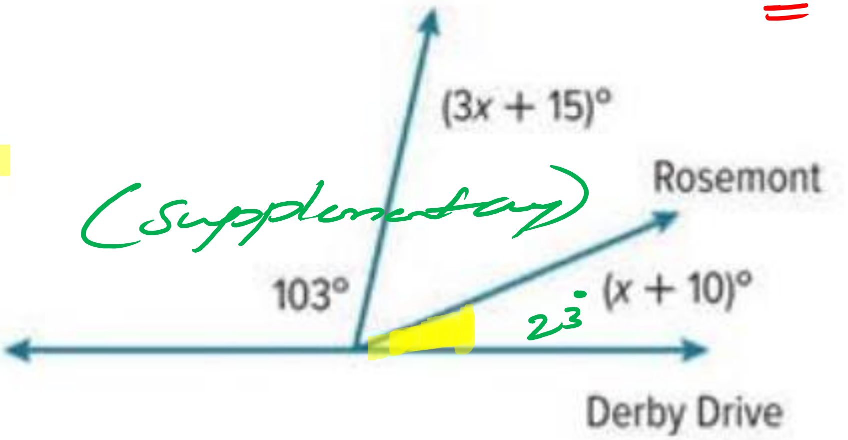
$\angle A = 4x+26$

$= 4(4)+26$

$= 16+26$

$= \underline{\underline{42^\circ}}$

10. Jess was drawing a map of her neighborhood. What is the measure of the angle of the intersection between Derby Drive and Rosemont?



$3x+15+x+10+103 = 180$ (supplementary)

$4x+128 = 180$

$4x = 180 - 128 = 52$

$x = \frac{52}{4} = \underline{\underline{13}}$

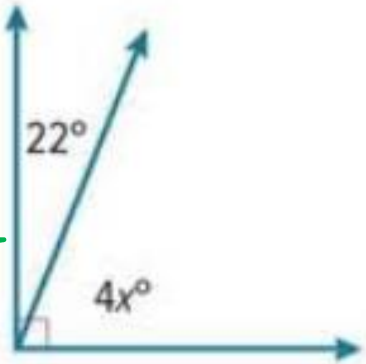
$\angle \; x+10$

$13+10 = 23^\circ$

Write and solve an equation to find the value of x in each figure. (Examples 2 and 4)

shape
Complementary

7.



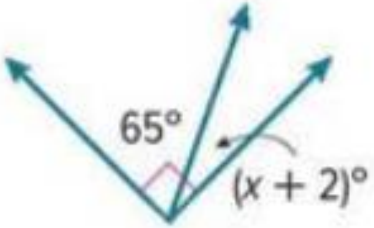
$4x + 22 = 90$

$4x = 90 - 22 = 68$

$x = \frac{68}{4}$

$= \underline{\underline{17}}$

8.



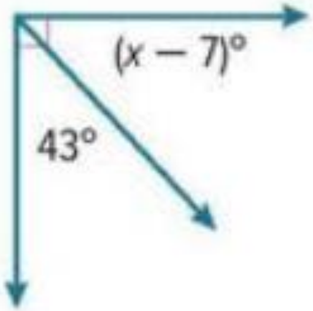
$x + 2 + 65 = 90$

$x + 67 = 90$

$x = 90 - 67 = 23$

$x = 23$

9.



$x - 7 + 43 = 90$

$x + 36 = 90$

$x = 90 - 36 = 54$

$x = \underline{\underline{54}}$

10.

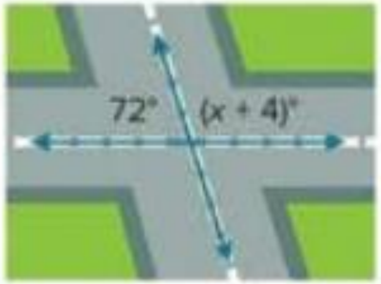
$7x + 110 = 180$

$7x = 180 - 110 = 70$

$x = \frac{70}{7}$

$x = \underline{\underline{10}}$

11.



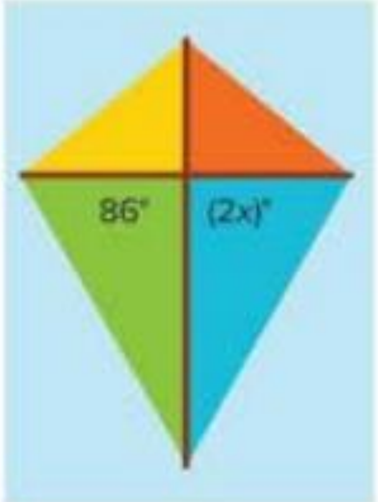
$x + 4 + 72 = 180$

$x + 76 = 180$

$x = 180 - 76 = 104$

$x =$

12.



$2x + 86 = 180$

$2x = 180 - 86 = 94$

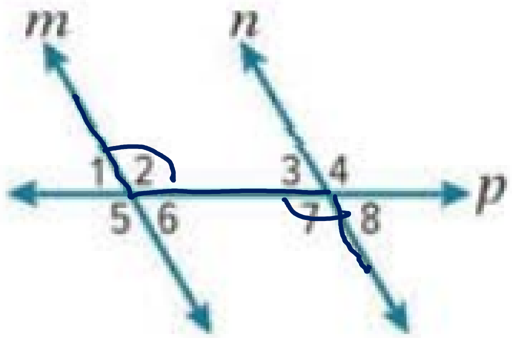
$x = \frac{94}{2}$

$x = \underline{\underline{47}}$

Practice

Go Online You can complete your homework online.

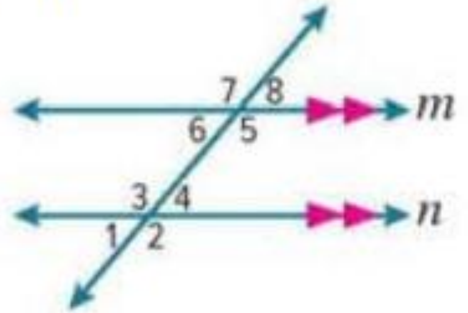
For Exercises 1–4, use the figure at the right. In the figure, line *m* is parallel to line *n*. For each pair of angles, classify the relationship in the figure as *alternate interior*, *alternate exterior*, or *corresponding*. (Examples 1 and 2)



1. ∠2 and ∠7 alternate interior.
2. ∠1 and ∠3 Corresponding
3. ∠4 and ∠5 alternate exterior.
4. ∠5 and ∠7 Corresponding

Test Practice

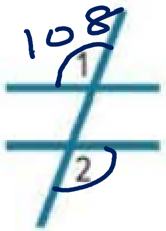
8. Multiselect In the figure, line m and line n are parallel. Select all of the statements that are true.



- [x] $\angle 1$ and $\angle 8$ are alternate exterior angles.
- [x] $\angle 3$ and $\angle 7$ are corresponding angles.
- [ ] $\angle 2$ and $\angle 8$ are corresponding angles.
- [x] $\angle 4$ and $\angle 6$ are alternate interior angles.
- [ ] $\angle 5$ and $\angle 7$ are corresponding angles.

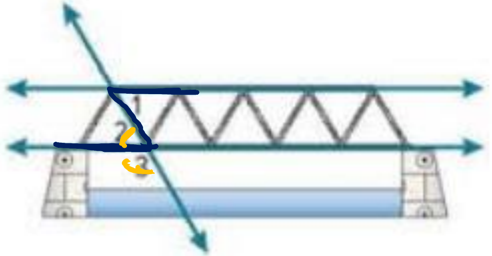
7. The symbol below is an equal sign with a slash through it. It is used to represent *not equal to* in math, as in $x \neq 5$. If $m\angle 1 = 108°$, classify the relationship between $\angle 1$ and $\angle 2$. Then find $m\angle 2$. Assume the equal sign consists of parallel lines.

$m\angle 2 = 108°$



alternate exterior angles are equal.

5. Arturo is designing a bridge for science class using parallel supports for the top and bottom beam. Find $m\angle 2$ and $m\angle 3$ if $m\angle 1 = 60°$. Justify your answer. (Example 3)



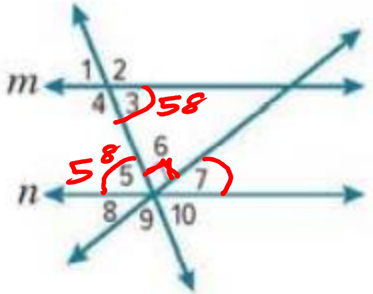
$m\angle 2 = 60°$ (alternate int. angle)

$m\angle 3 + 60 = 180$

$m\angle 3 = 180 - 60$

$= 120°$.

6. In the figure, line m is parallel to line n. The measure of $\angle 3$ is 58°. What is the measure of $\angle 7$? (Example 4)



$m\angle 7 + 58 + 90 = 180$

$m\angle 7 = 180 - 148$

$= 32°$ //

Apply

9. Angles A and B are corresponding angles formed by two parallel lines cut by a transversal. If $m\angle A = 4x°$ and $m\angle B = (3x + 7)°$, find the value of x. Explain.

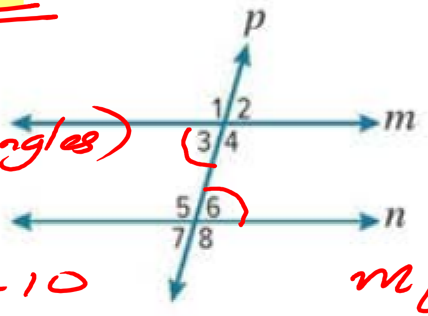
$m\angle A = m\angle B$ (corresponding angles are equal)

$4x = 3x + 7$
$-3x \quad -3x$

$1x = +7$

$x = 7$

10. In the figure, line m is parallel to line n. If $m\angle 3 = (7x - 10)°$ and $m\angle 6 = (5x + 10)°$, what are the measures of $\angle 3$ and $\angle 6$?



$m\angle 3 = m\angle 6$ (alternate int: angles)

$7x - 10 = 5x + 10$
$-5x \quad -5x$

$2x - 10 = 10$

$2x = 10 + 10$

$x = \frac{20}{2} = 10$

$m\angle 3 = 7x - 10$
$= 7(10) - 10$
$m\angle 3 = 60°$

$m\angle 6 = 5x + 10$
$= 5(10) + 10$
$m\angle 6 = 60°$

Example 4 Draw Triangles with Technology

Use technology to determine whether or not it is possible to draw a triangle with side lengths of 3, 5, and 6 inches. If so, draw the triangle. If not, explain why.

$3 + 5 = 8$

$8 > 6$

It is possible to draw a triangle.

Check

Determine whether or not it is possible to draw a triangle with side lengths 3, 4, and 5 inches. If so, use a sketch to draw the triangle. If not, explain why.

Show your work here

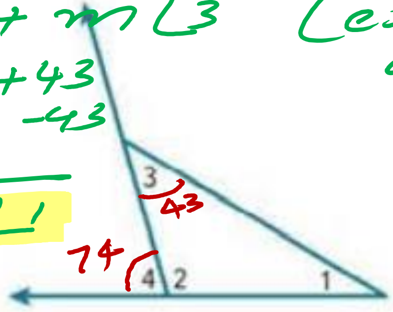
$3 + 4 = 7$

$7 > 5.$

possible.

The sum of the smallest two sides is greater than the biggest side.

5. In the figure, $m\angle 4 = 74°$ and $m\angle 3 = 43°$. Find the measures of $\angle 1$ and $\angle 2$. (Example 4)



$m\angle 4 = m\angle 1 + m\angle 3$ (exterior angle theorem)

$74 = m\angle 1 + 43$

$-43 \quad -43$

$31 = m\angle 1$

$m\angle 4 + m\angle 2 = 180°$ (linear pair)

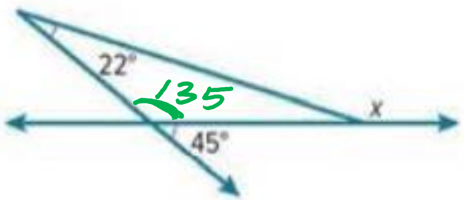
$74 + m\angle 2 = 180$

$m\angle 2 = 180 - 74$

$= 106°$

Test Practice

6. Open Response What is the measure of $\angle x$, in degrees, in the figure shown?



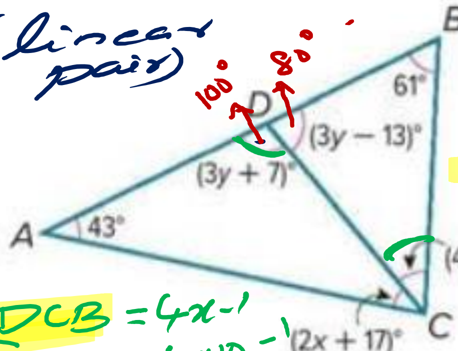
$180 - 45 = 135$ (linear pair)

$\angle x = 22 + 135$ (exterior angle theorem)

$\angle x = 157°$

Apply

7. What are the measures of $\angle ADC$ and $\angle DCB$ in the figure below?



$3y + 7 + 3y - 13 = 180°$ (linear pair)

$6y - 6 = 180$

$6y = 186$

$y = \frac{186}{6}$

$y = 31$

$\angle ADC = 3y + 7$

$= 3(31) + 7$

$= 93 + 7$

$\angle ADC = 100°$

$61 + 80 + 4x - 1 = 180$

$140 + 4x = 180$

$4x = 40$

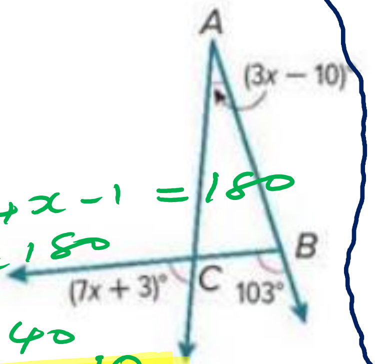
$x = 10$

$\angle DCB = 4x - 1$

$= 4 \times 10 - 1$

$= 39°$

8. What are the measures of $\angle CAB$ and $\angle ACB$ in the figure below?



$\angle ACB = 7x + 3$ (vertical angle)

$\angle ABC = 180 - 103$

$= 77$

$77 + 3x - 10 + 7x + 3$

$= 180$

$10x + 70 = 180$

$10x = 110$

$x = 11$

$\angle CAB = 3x - 10$

$= 3(11) - 10$

$= 33 - 10$

$= 23°$

$\angle ACB = 7x + 3$

$= 7(11) + 3$

$= 80°$

Refer to the map of Florida. (Example 1)

1. What is the actual distance between Daytona Beach and Orlando? Use a ruler to measure the map.

2. What is the actual distance between Tampa and Orlando? Use a ruler to measure the map.

Refer to the floor plan. The scale of the floor plan is 1 inch = 6 feet. (Example 2)

3. Find the actual area of the hallway.

4. Find the actual area of the kitchen.

Kitchen 3

3

inch	ft
1	6
3	?

Actual $l = 6 \times 3 = 18$ ft

Actual $w = 6 \times 3 = 18$ ft

Actual Area $= 18 \times 18$
$= 324$ ft^2

Hallway $\frac{1}{2}$ in

5 in

inch	feet
1	6
5	?

$l = 5 \times 6 = 30$ ft

inch	feet
1	6
$\frac{1}{2}$	?

$w = \frac{1}{2} \times 6 = 3$ ft

Actual Area $= l \times w$
$= 30 \times 3$
$= 90$ ft^2

LEARN PAGE 745,746,747

11. MP **Persevere with Problems** Find the distance around the figure. Use 3.14 for π.

Circle

$C = \pi d$

$\to \frac{\pi d}{2} = \frac{3.14 \times 25}{2}$

$= 39.25$

distance $= 25 + 39.25$

$= 64.25$ ft.

12. Draw and label a circle with a circumference between 10 and 15 centimeters. Label the length of the diameter.

13. MP **Reason Abstractly** How would the circumference of a circle change if its radius was doubled? Provide an example to support your reasoning.

$r = 5$ $C = 2\pi \times 5 = 10\pi$.

$r = 10$ $C = 2\pi \times 10 = 20\pi$

Circumference doubled.

$r = 5$ $A = \pi \times 5^2 = 25\pi$

$r = 10$ $A = \pi \times 10^2 = 100\pi$

Area increases 4 times.

14. MP **Justify Conclusions** Use mental math to determine if the circumference of a circle with a radius of 5 inches will be greater than or less than 30 inches. Write an argument that can be used to justify your solution.

$r = 5$

$C = 2\pi r$

$= 2 \times \pi \times 5$

$= 10\pi$

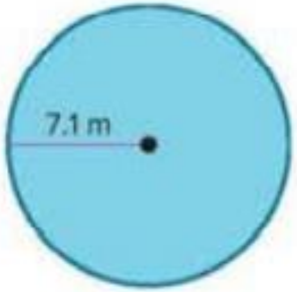
> 30

Practice

Go Online You can complete your homework online.

1. Find the area of the circle. Use 3.14 for π. Round to the nearest hundredth if necessary. (Example 1)

$\text{Area} = \pi r^2$



$A = 3.14 \times 7.1 \times 7.1$

$= 158.29\ m^2$

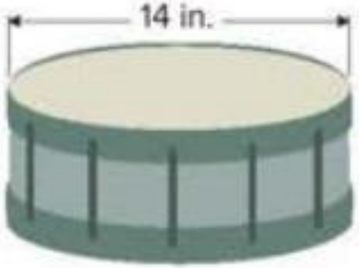
2. Find the area of the circle. Use 3.14 for π. Round to the nearest hundredth if necessary. (Example 1)

$A = \pi r^2$

$= 3.14 \times 4.25 \times 4.25$

$= 56.72\ in^2$

3. What is the area of the drumhead on the drum? Use 3.14 for π. Round to the nearest hundredth if necessary. (Example 2)



$r = \frac{d}{2}$

$= \frac{14}{2}$

$r = 7$

$\text{Area} = \pi r^2$

$= 3.14 \times 7 \times 7$

$= 153.86\ in^2$

4. What is the area of one side of the penny? Use 3.14 for π. Round to the nearest hundredth if necessary. (Example 2)

$r = \frac{d}{2}$

$= \frac{19}{2}$

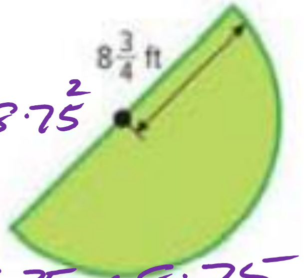
$r = 9.5$

$A = \pi r^2$

$= 3.14 \times 9.5 \times 9.5$

$= 283.39\ mm^2$

5. Mr. Ling is adding a pond in the shape of a semicircle in his backyard. What is the area of the pond? Use 3.14 for π. Round to the nearest hundredth if necessary. (Example 3)



$\text{Area} = \frac{1}{2}\pi r^2$

$= \frac{1}{2} \times 3.14 \times 8.75^2$

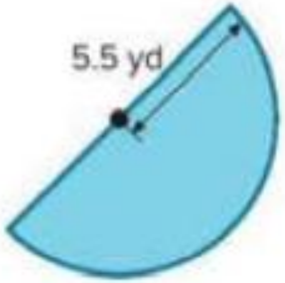
$r = 8\frac{3^{\times 25}}{4_{\times 25}}$

$= 8.75$

$= \frac{1}{2} \times 3.14 \times 8.75 \times 8.75$

$= 120.2\ ft^2.$

6. Vidur needs to buy mulch for his garden. What is the area of his garden? Use 3.14 for π. Round to the nearest hundredth if necessary. (Example 3)



$\text{Area} = \frac{1}{2}\pi r^2$

$= \frac{1}{2} \times 3.14 \times 5.5 \times 5.5$

$= 47.49\ yd^2$

7. The exact circumference of a circle is 18π inches. What is the approximate area of the circle? Use 3.14 for π. Round to the nearest hundredth if necessary. (Example 4)

$\text{Area} = \pi r^2$

$= 3.14 \times 9 \times 9$

$= 254.34\ in^2$

$C = 18\pi.$

$2\pi r = 18\pi$

$r = \frac{18\pi}{2\pi}$

$r = 9$

Test Practice

8. **Open Response** The exact circumference of a circle is 34π meters. What is the approximate area of the circle? Use 3.14 for π. Round to the nearest hundredth if necessary.

$A = 3.14 \times 17 \times 17$

$= 907.46\ m^2$

$C = 34\pi$

$2\pi r = 34\pi$

$r = \frac{34\pi}{2\pi}$

$r = 17$

Find the area of each figure. If necessary, use 3.14 for π and round to the nearest hundredth. (Example 1)

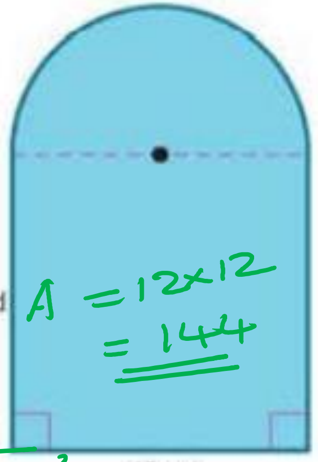
1.

Semicircle

$A = \frac{1}{2}\pi r^2$

$= \frac{1}{2} \times 3.14 \times 6 \times 6$

$= 56.52$



$A = 12 \times 12$

$= 144$

$d = 6$

$r = 3$

Total $= 144 + 56.52$

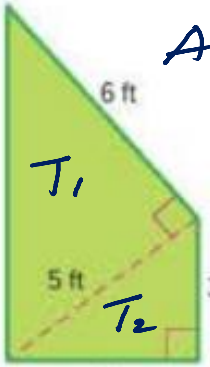
200.52 yd^2

2.

Area $T_1 = \frac{1}{2} \cdot b \cdot h$

$= \frac{1}{2} \times 5 \times 6$

$= 15$



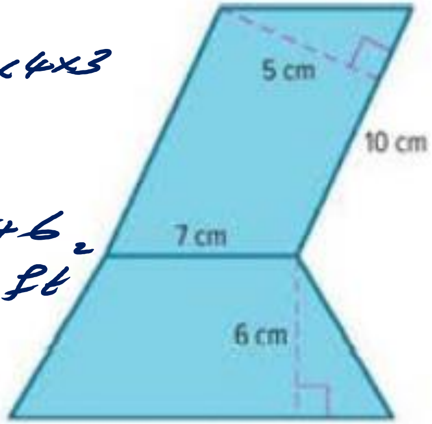
Area $T_2 = \frac{1}{2} \times 4 \times 3$

$= 6$

Total $= 15 + 6$

$= 21 \text{ ft}^2$

3.



Parallelogram

$A = bh$

$= 10 \times 5$

$= 50$

Trapezoid

$A = \frac{1}{2}(a+b) \cdot h$

$= \frac{1}{2}(14+7) \times 6$

$= \frac{1}{2} \times 21 \times 6$

$= 63$

Total $= 50 + 63$

$= 113 \text{ cm}^2$

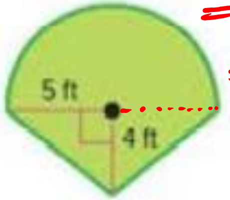
4.

Semicircle

$A = \frac{1}{2}\pi r^2$

$= \frac{1}{2} \times 3.14 \times 5^2$

$= 39.25$



Triangle

$A = \frac{1}{2} \cdot b \cdot h$

$= \frac{1}{2} \times 4 \times 5$

$= 10$

Total $= 39.25 + 10 + 10$

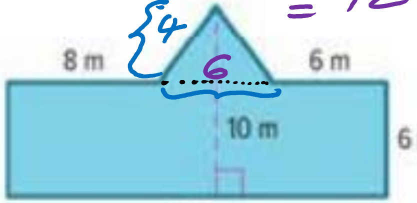
$= 59.25 \text{ ft}^2$

5.

Triangle

$A = \frac{1}{2} \times 6 \times 4$

$= 12 \text{ m}^2$



Rectangle $A = 20 \times 6$

$= 120$

Total $= 120 + 12$

$= 132 \text{ m}^2$

6.

Triangle

$A = \frac{1}{2} \times 1.1 \times 4.8$

$= 2.64$

Trapezoid

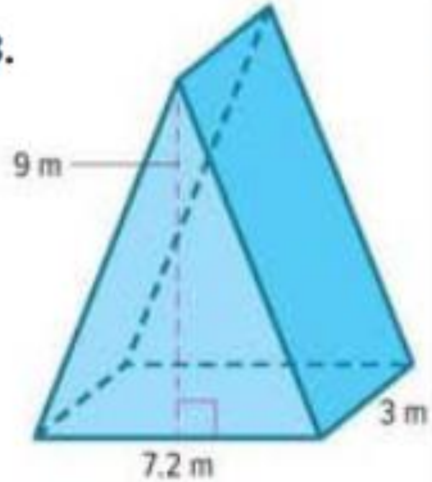
$A = \frac{1}{2}(3.6 + 4.8) 5.9$

$= 24.78$

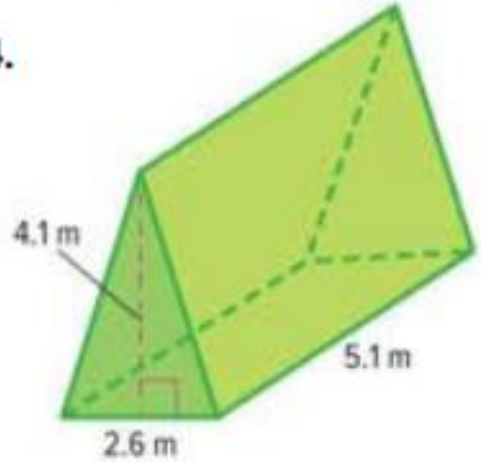
Total $= 27.42 \text{ cm}^2$

Find the volume of each figure. Round to the nearest tenth if necessary. (Examples 2 and 3)

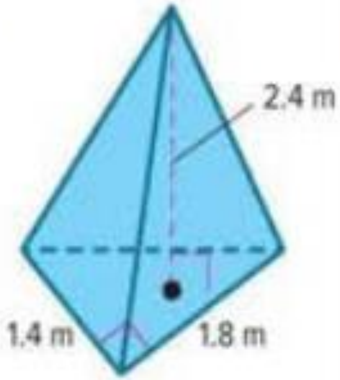
3.



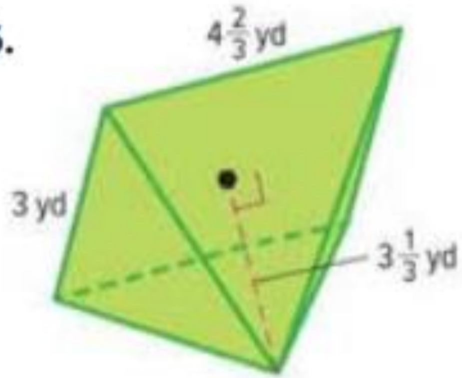
4.



5.



6.



③ $V = B \cdot h$

$= 32.4 \times 3$

$= 97.2 \text{ m}^3$

$B = \frac{1}{2} bh$

$= \frac{1}{2} \cdot 7.2 \times 9$

$= 32.4$

B → Base area.

④ $V = B \cdot h$

$B = \frac{1}{2} \times 2.6 \times 4.1$

$= 5.33$

$V = 5.33 \times 5.1$

$= 27.2 \text{ m}^3$

⑤ $V = \frac{1}{3} \cdot B \cdot h$

$B = \frac{1}{2} \cdot bh$

$= \frac{1}{2} \times 1.8 \times 1.4$

$= 1.26$

$V = \frac{1}{3} \times 1.26 \times 2.4$

$= 1.0 \text{ m}^3$

⑥ $V = \frac{1}{3} \cdot B \cdot h$

$B = l \times w$

$= 4\frac{2}{3} \times 3$

$= \frac{14}{3} \times 3$

$= 14$

$V = \frac{1}{3} \times 14 \times 3\frac{1}{3}$

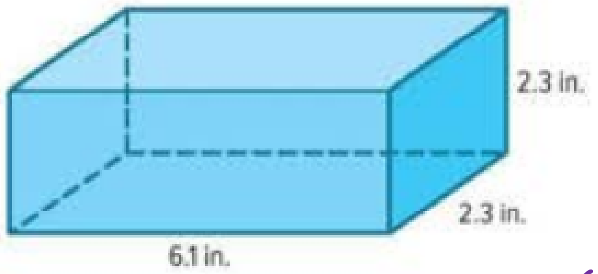
$= \frac{1}{3} \times 14 \times \frac{10}{3}$

$= \frac{140}{9}$

$= 15.6 \text{ yd}^3$

Apply

7. Oscar is making a play block for his baby sister by gluing fabric over the entire surface of a foam block. Is 65 square inches of fabric enough? If so, how much fabric will remain? If not, how much more fabric will he need?



$S \cdot A = 2lw + 2lh + 2wh$

$= 2 \times 6.1 \times 2.3 + 2 \times 6.1 \times 2.3 + 2 \times 2.3 \times 2.3 = 28.06 + 28.06 + 10.58 = 66.7$ sq in.

The fabric is not enough. Need $1.7\ in^2$ more

$66.7 - 65 = 1.7$

8. When wrapping a birthday gift in the shape of a rectangular prism for his mother, Kenji adds an additional 2.5 square feet of gift wrap to allow for overlap. How many square feet of gift wrap will Kenji use to wrap a gift 3.5 feet long, 18 inches wide, and 2 feet high?

1 feet 12 inches

? 18 inches

$\frac{18}{12} = 1.5$ ft.

$SA = 2(lw + lh + wh)$

$= 2(3.5 \times 1.5 + 3.5 \times 2 + 1.5 \times 2)$

$= 30.5$ sq ft

Total $= 30.5 + 2.5$

$= 33$ sq ft

9. Find the surface area of a rectangular prism with a height of $4\frac{1}{3}$ yards, a length of 6.2 yards, and a width of 3.15 yards.

$S \cdot A = 2(lw + lh + wh)$

$= 2\left(\frac{13}{3} \times 6.2 + \frac{13}{3} \times 3.15 + 6.2 \times 3.15\right)$

$= 2(26.9 + 13.65 + 19.53) = 120.16$ sq yd

V of cylinder $= \pi r^2 h$
$= 3.14 \times 1.5^2 \times 4$
$= 28.26 \text{ in}^3$

5. A wooden toy block is in the shape of a cylinder. The toy block has a height of 4 inches and a diameter of 3 inches. How much does the toy block weigh if 1 cubic inch of wood weighs 0.55 ounce? Round to the nearest tenth. (Example 3)

$1 \text{ in}^3 = 0.55$ ounce
$28.26 \text{ in}^3 = 28.26 \times 0.55$
$= 15.5$ ounce

$d = 3$
$r = \frac{3}{2}$
$= 1.5$

6. A large rainwater collection tub is shaped like a cylinder. The diameter is 28 inches and the height is 40 inches. If the tub is 75% filled, what is the volume of water in the tub? Round to the nearest tenth.

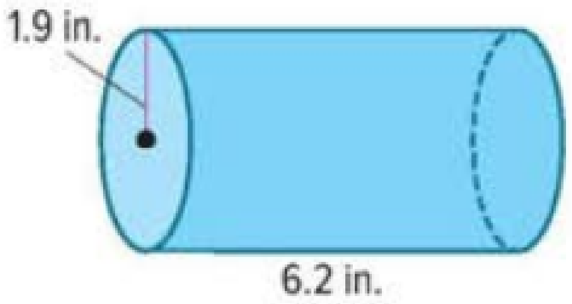
$r = \frac{28}{2}$
$= 14$

Volume $= \pi r^2 h$
$= 3.14 \times 14 \times 14 \times 40$
$= 24617.6 \text{ in}^3$

75% of $24617.6 = \frac{75}{100} \times 24617.6$
V of water $= 18463.2 \text{ in}^3$

Test Practice

7. Multiple Choice What is the volume of the cylinder shown? (Use 3.14 for π.)



Ⓐ 22.382 in^3

Ⓑ 70.279 in^3 ✓

Ⓒ 73.036 in^3

Ⓓ 229.333 in^3

$V = \pi r^2 h$
$= 3.14 \times 1.9 \times 1.9 \times 6.2$
$= 70.279 \text{ in}^3$

Apply

8. A soup can, shaped like cylinder, has a diameter of 3.5 inches and a height of 5 inches. Each serving of soup is 15 cubic inches. If a can of soup this size costs $1.99, what is the cost for each serving of soup? Round to the nearest cent.

$r = \frac{3.5}{2}$

$= 1.75$

$V = \pi r^2 h$

$= 3.14 \times 1.75^2 \times 5$

$= 48.08 \text{ in}^3$

No: of soup $= \frac{48.08}{15}$

$= 3.2$

$\approx 3.$

Cost of each $= \frac{1.99}{3} \approx 0.66$ cent

9. A large water tank measures 6 feet across and 4 feet high. It is being filled with water at a rate of 10 gallons per minute. About how many hours will it take to fill the pool if 1 cubic foot of water is about 7.5 gallons? Round to the nearest tenth.

$V = l \times w \times h$

$= 6 \times 6 \times 4$

$= 144$ cubic feet

1 cu.ft $= 7.5$ g

144 cu.ft $= 144 \times 7.5$

$= 1080$ gallons.

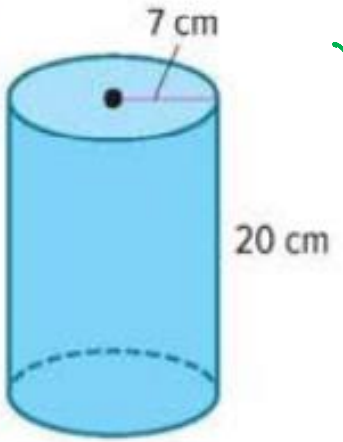
min	gallon
1	10
?	1080

$\frac{1080}{10} = 108$ min

$= 1$ hour 48 min

Find the volume of each cylinder. Round to the nearest tenth. (Example 1)

1.

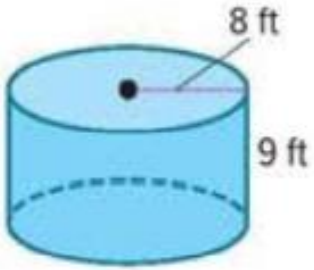


$V = \pi r^2 h$

$= 3.14 \times 7 \times 7 \times 20$

$=$

2.



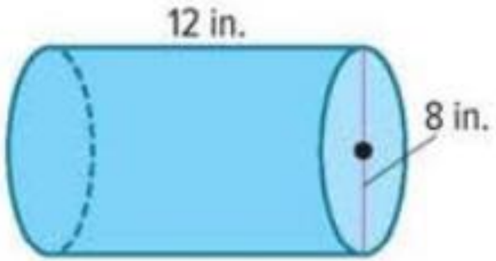
$V = \pi r^2 h$

$= 3.14 \times 8 \times 8 \times 9$

$=$

Find the volume of each cylinder. Express your answer in terms of π. (Example 2)

3.



$r = \frac{8}{2}$

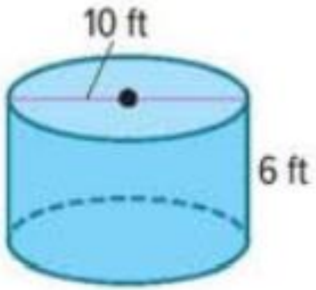
$= 4$

$V = \pi r^2 h$

$= \pi \times 4^2 \times 12$

$= 192\pi \text{ in}^3$

4.



$V = \pi r^2 h$

$= \pi \times 5^2 \times 6$

$= \underline{\underline{150\pi \text{ ft}^3}}$

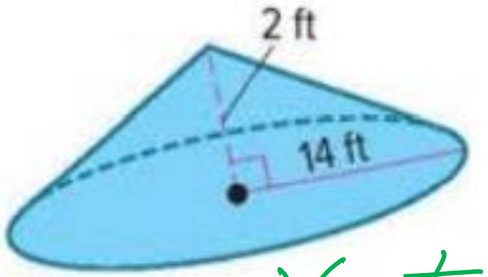
$d = 10$

$r = \frac{10}{2}$

$= 5$

Find the volume of each cone. Express your answer in terms of π. (Example 1)

1.

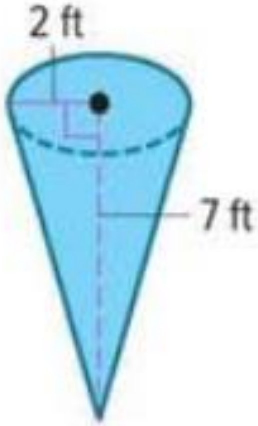


$V = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \pi \times 14^2 \times 2$

$= 130.7\pi$

2.

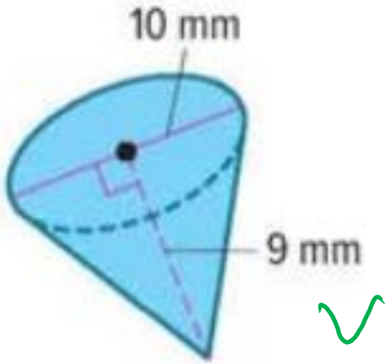


$V = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times \pi \times 2^2 \times 7$

$=$

3.

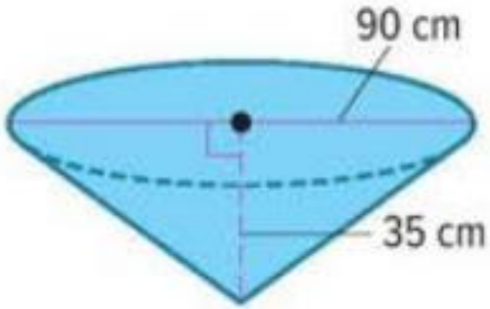


$r = \frac{10}{2} = 5$

$V = \frac{1}{3} \times \pi \times 5^2 \times 9$

$=$

4.



$d = 90$

$r = \frac{90}{2}$

$= 45$

$V = \frac{1}{3} \times \pi \times 45^2 \times 35$

$=$

Find the volume of each hemisphere. Round to the nearest tenth. (Example 4)

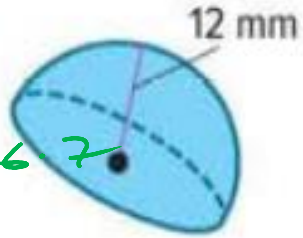
5.

$V = \frac{2}{3}\pi r^3$

$= \frac{2}{3} \times 3.14 \times 6.7 \times 6.7 \times 6.7$

$=$

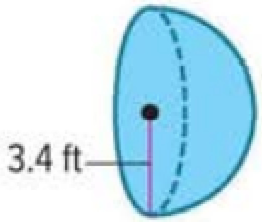
6.



$V = \frac{2}{3} \times 3.14 \times 12 \times 12 \times 12$

$=$

3. Luci and Stefan are finding the volume of the hemisphere shown. Luci determines the volume to be 26.203π cubic feet and Stefan determines the volume to be 82.318 cubic feet. Whose answer is closer to the exact volume? Write an argument that can be used to defend your solution.



$V = \frac{2}{3}\pi r^3$

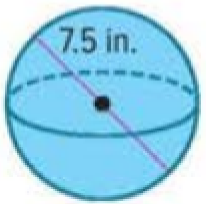
$= \frac{2}{3} \times \pi \times 3.4 \times 3.4 \times 3.4$

$= 26.203\pi$ or 82.28

Luci

14. MP **Find the Error** A student found the volume of the sphere shown. Find her mistake and correct it.

$\frac{4}{3}\pi(7.5)^3 \approx 1{,}767.1 \text{ in}^3$



$V = \frac{4}{3}\pi r^3$

$r = \frac{7.5}{2}$

$= 3.75$

$= \frac{4}{3} \times 3.14 \times 3.75^3$

$=$

The student used diametre instead of radius.

Surface area = 2 × base area + lateral area

lateral area = base perimetre × height

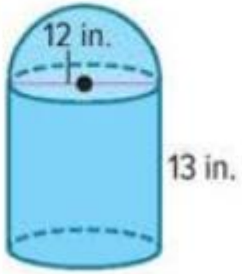
1. Find the volume of the solid. Round to the nearest tenth. (Example 1)

hemisphere

$V = \frac{2}{3}\pi r^3$

$= \frac{2}{3} \times \pi \times 6^3$

$= 144\pi$



cylinder

$V = \pi r^2 h$

$= \pi \times 6^2 \times 13$

$= 468\pi$

Total $= 144\pi + 468\pi$

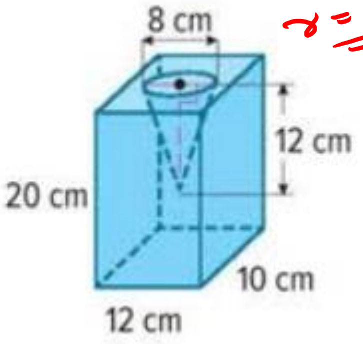
$= 612\pi$

$= 612 \times 3.14$

$1921.68\ in^3$

2. Find the volume of the flower vase. Round to the nearest tenth. (Example 2)

$r = 4$



cuboid

$V = l \times w \times h$

$= 12 \times 10 \times 20$

$= 2400$

cone

$V = \frac{1}{3}\pi r^2 h$

$= \frac{1}{3} \times 3.14 \times 4^2 \times 12$

$= 200.96$

V of vace $= 2400 - 200.96$

$= 2199.04\ cm^3$

3. Mya's lunchbox is shown. What is the volume of the lunchbox? Round to the nearest tenth if necessary. (Example 3)

Triangular prism

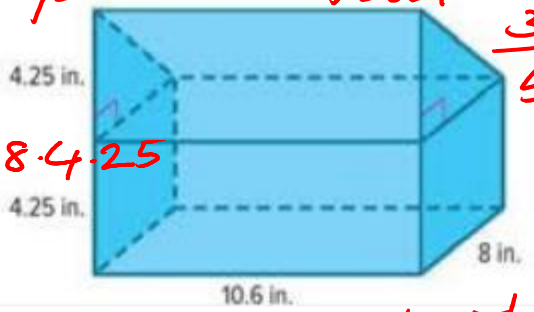
$V = B \cdot h$

$B = \frac{1}{2} \cdot 8 \cdot 4.25$

$= 17$

$V = 17 \times 10.6$

$= 180.2$



Total $= 180.2 + 360.4$

$540.6\ in^3$

cuboid

$V = l \times w \times h$

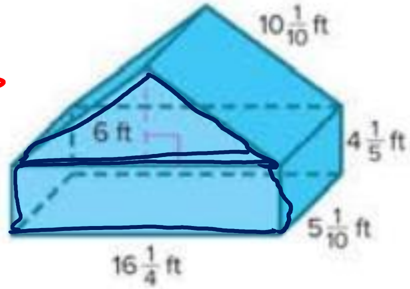
$= 10.6 \times 8 \times 4.25$

$= 360.4$

4. Find the surface area of the composite solid. Round to the nearest tenth if necessary. (Example 4)

$SA = 131.625 + 131.625 + 233.325$

$= 496.6\ ft^2$



Lateral area = Base perimeter × height

$= 45.75 \times 5\frac{1}{10}$

$= 233.325$

Rect: area $= 16\frac{1}{4} \times 5\frac{1}{10}$

$= 82.875$

Tria: area $= \frac{1}{2} \times 16\frac{1}{4} \times 6$

$= 48.75$

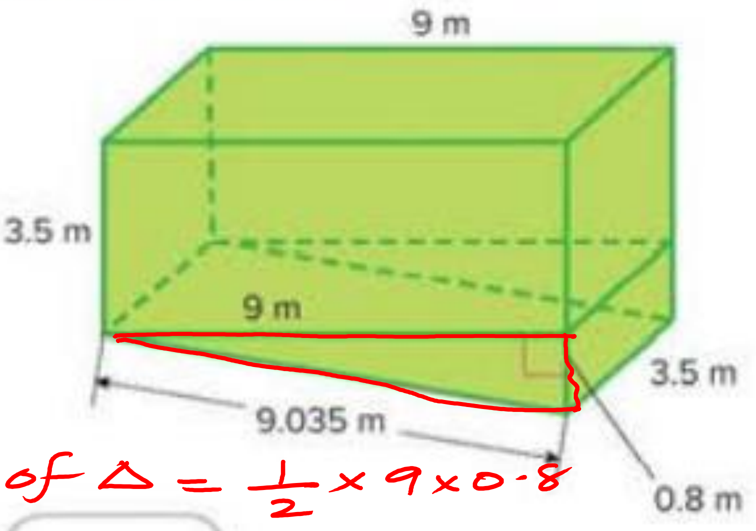
Base area $= 82.875 + 48.75$

$= 131.625$

Base perimetre $= 16\frac{1}{4} + 5\frac{1}{10} + 10\frac{1}{10} + 10\frac{1}{10} + 4\frac{1}{5} = 45.75$

Test Practice

5. Open Response Find the surface area of the composite solid. Round to the nearest tenth if necessary.



Area of $\triangle = \frac{1}{2} \times 9 \times 0.8$
$= 3.6$

Area of Rectangle $= 3.5 \times 9$
$= 31.5$

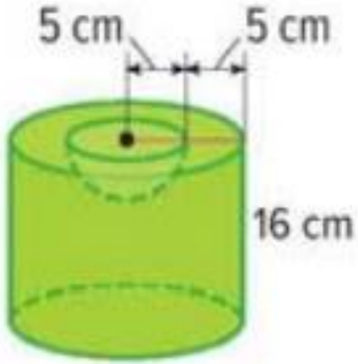
Base area $= 31.5 + 3.6 = 35.1$

Base perimetre $= 9.035 + 0.8 + 3.5 + 9 + 3.5$
$= 25.835$

Lateral area $= 25.835 \times 3.5 = 90.4$

Surface area $= 2 \times 35.1 + 90.4 = 160.6\ m^2$

6. Find the volume of the solid. Round to the nearest tenth.



Cylinder

$V = \pi r^2 h$
$= \pi \times 10^2 \times 16$
$= 1600\pi$

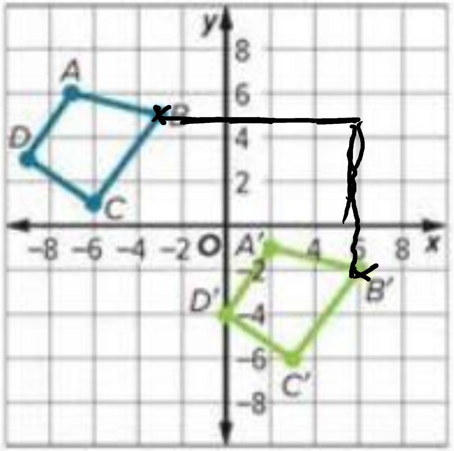
Hemisphere

$V = \frac{2\pi r^3}{3}$
$= \frac{2 \times \pi \times 5^3}{3}$
$= 83.3\pi$

V of the Solid $= 1600\pi - 83.3\pi$
$= 1516.7\pi$
$= 4762.3\ cm^3$

Example 3 Use Coordinate Notation to Describe Translations

Use coordinate notation to describe the translation.



Choose a point on the preimage and its corresponding point on the image. For example, Point A is located at $(-7, 6)$. Point A' is located at $(2, -1)$.

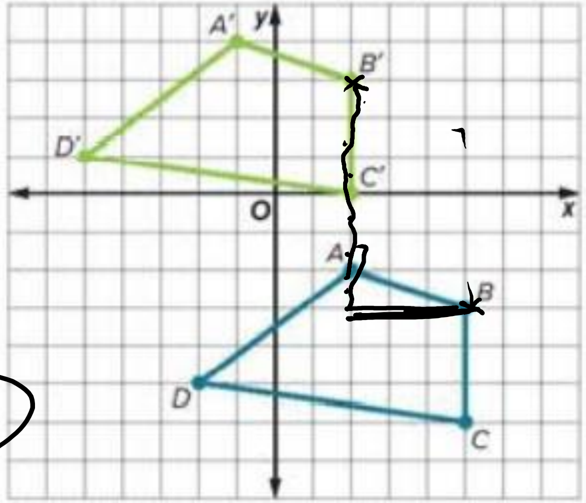
9 unit right
7 unit down

$(x, y) \rightarrow (x+9, y-7)$

Check

Use coordinate notation to describe the translation.

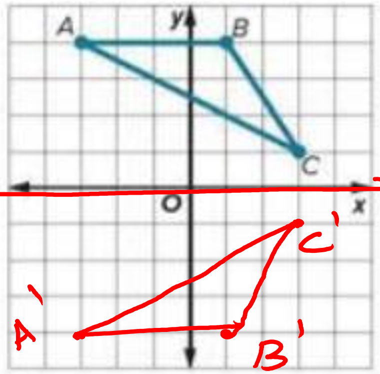
Show your work here



3 unit left
6 unit up.

$(x, y) \rightarrow (x-3, y+6)$

1. The graph of $\triangle ABC$ is shown. Graph the image of $\triangle ABC$ after a reflection across the x-axis. Write the coordinates of the reflected image. (Example 1)



mirror line

line of reflection

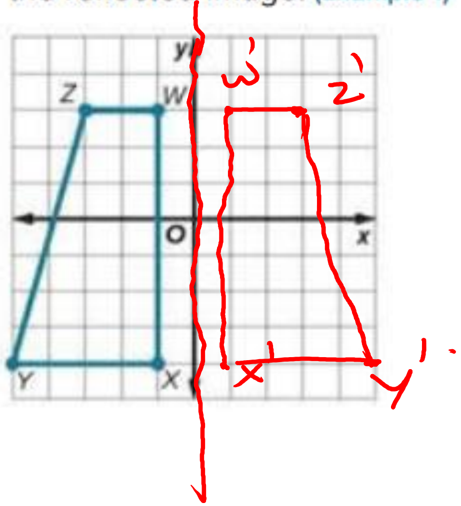
$(x, y) \rightarrow (x, -y)$.

$A(-3, 4) \rightarrow (-3, -4)$

$B(1, 4) \rightarrow (1, -4)$

$C(3, 1) \rightarrow (3, -1)$

2. The graph of trapezoid $WXYZ$ is shown. Graph the image of $WXYZ$ after a reflection across the y-axis. Write the coordinates of the reflected image. (Example 1)



$(x, y) \rightarrow (-x, y)$.

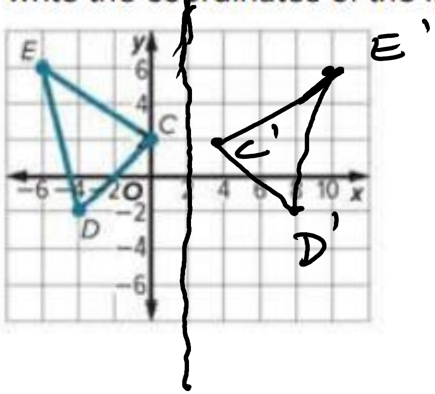
$W(-1, 3) \rightarrow W'(1, 3)$

$X(-1, -4) \rightarrow X'(1, -4)$

$Y(-5, -4) \rightarrow Y'(5, -4)$

$Z(-3, 3) \rightarrow Z'(3, 3)$.

3. The graph of $\triangle CDE$ is shown. Graph the image of $\triangle CDE$ after a reflection across the line $x = 2$. Include the line of reflection. Then write the coordinates of the image. (Example 2)

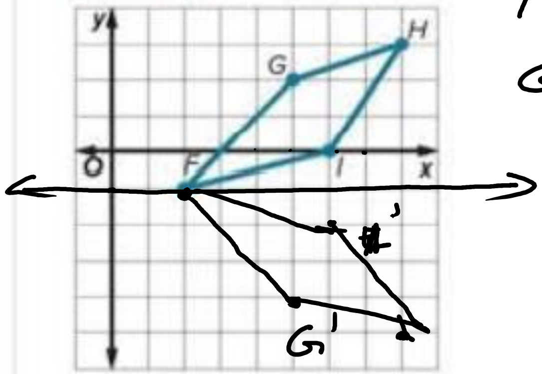


$C'(4, 2)$

$D'(8, -2)$

$E'(10, 6)$

4. The graph of polygon $FGHI$ is shown. Graph the image of $FGHI$ after a reflection across the line $y = -1$. Include the line of reflection. Then write the coordinates of the image. (Example 2)



$F'(2, -1)$

$G'(5, -4)$

$H'(8, -5)$

$I'(6, -2)$

9. MP **Justify Conclusions** A classmate concludes that the image of a figure rotated 270° clockwise will have the same coordinates as the image of the same figure rotated 90° counterclockwise. Is your classmate correct? Write an argument that can be used to defend your solution.

The student is correct.

Rotation

Clock wise

90° cw $(x,y) \to (y,-x)$

180° cw $(x,y) \to (-x,-y)$

270° cw $(x,y) \to (-y,x)$

Counter clock

90° ccw $(x,y) \to (-y,x)$

180° ccw $(x,y) \to (-x,-y)$

270° ccw $(x,y) \to (y,-x)$

10. MP **Model with Mathematics** A figure is rotated 270° counterclockwise about the origin. Then the image is rotated 90° counterclockwise about the origin. Complete the coordinate notation that represents the series of rotations. What can you conclude about the position of the figure after the series of rotations?

$(x, y) \to (\boxed{y}, \boxed{-x}) \to (\boxed{x}, \boxed{y})$

11. MP **Reason Inductively** Determine whether the following statement is *always*, *sometimes*, or *never* true. Write an argument that can be used to defend your solution.

A figure and its rotated image will have the same area, but different perimeters.

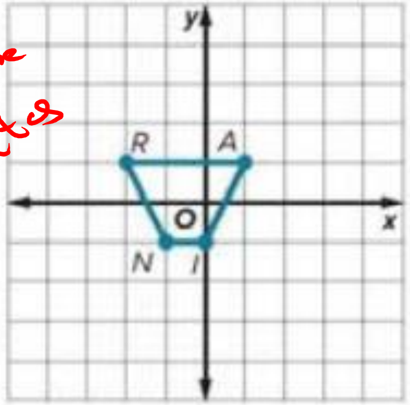
Never true. They are congruent so same area & perimeter.

$(x, y) \longrightarrow (kx, ky)$ $k \rightarrow$ scale factor

1. Trapezoid *RAIN* has vertices $R(-2, 1)$, $A(1, 1)$, $I(0, -1)$, and $N(-1, -1)$. Graph the image of the figure after a dilation with a scale factor of 2. (Example 1)

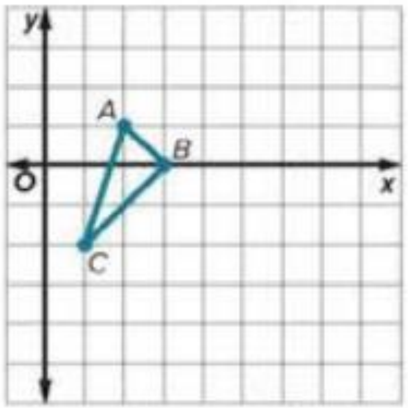
×2

multiply the co-ordinates with 2



$R'(-4, 2)$
$A'(2, 2)$
$I'(0, -2)$
$N'(-2, -2)$

2. Triangle *ABC* has vertices $A(2, 1)$, $B(3, 0)$, and $C(1, -2)$. Graph the image of the figure after a dilation with a scale factor of 3. (Example 1)

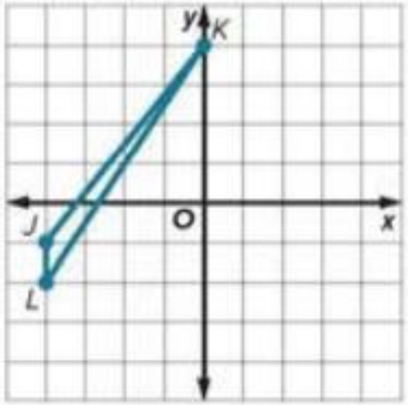


$A'(6, 3)$
$B'(9, 0)$
$C'(3, -6)$

multiply by 3.

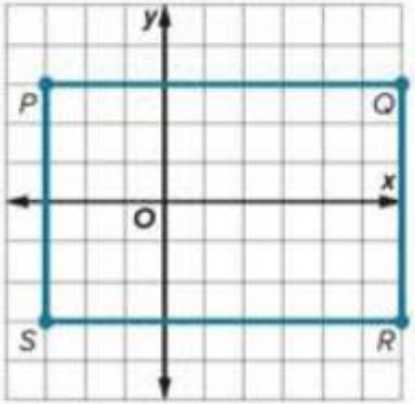
3. Triangle *JKL* has vertices $J(-4, -1)$, $K(0, 4)$, and $L(-4, -2)$. Graph the image of the figure after a dilation with a scale factor of 0.5. (Example 2)

multiply by $\frac{1}{2}$



$J'(-2, -0.5)$
$K'(0, 2)$
$L'(-2, -1)$

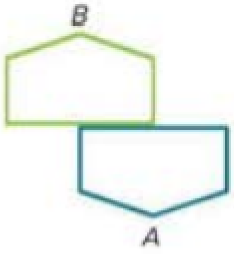
4. Rectangle *PQRS* has vertices $P(-3, 3)$, $Q(6, 3)$, $R(6, -3)$, and $S(-3, -3)$. Graph the image of the figure after a dilation with a scale factor of $\frac{1}{3}$. (Example 2)



$P'(-1, 1)$
$Q'(2, 1)$
$R'(2, -1)$
$S'(-1, -1)$

multiply by $\frac{1}{3}$.

4. For his school web page, Manuel created the logo shown at the right. What transformations could be used to create the logo if Figure A is the preimage and Figure B is the image? Are the two figures congruent? (Example 4)



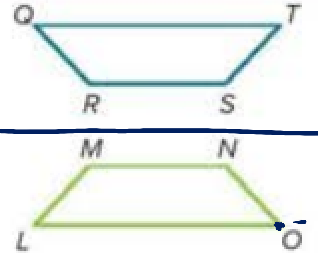
(i) Translation, Reflection.
(ii) Rotation 180°, Translation.

5. For the local art gallery opening, the curator had the design shown at the right created. What transformations could be used to create the design if Figure A is the preimage and Figure B is the image? Are the two figures congruent? (Example 4)

Reflection and then Translation.

Test Practice

6. Multiple Choice Trapezoid *QRST* and its image are shown. What transformation maps trapezoid *QRST* onto trapezoid *LMNO*?



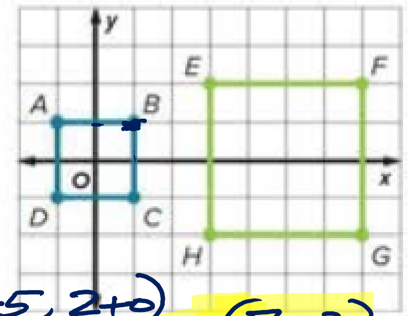
(A) dilation about vertex *R*

(B) vertical translation

(C) reflection across a horizontal line

(D) rotation about vertex *Q*

8. Square *ABCD* is similar to square *EFGH* because a dilation with a scale factor of 2 with the center of dilation at the origin, followed by a translation 5 units to the right maps square *ABCD* onto square *EFGH*.



Dilation sf: 2 → Translation (5, 0)

Tran (5,0) → Dilation SF2

a. If you perform the translation first and then the dilation, will the squares still map onto one another? Explain.

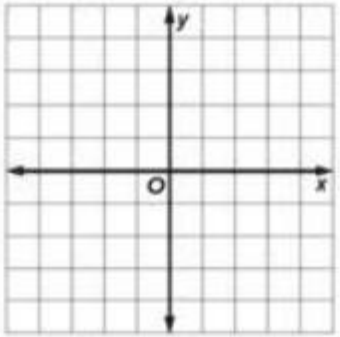
$B(1,1) \xrightarrow[s.f\,2]{\text{Dilati}} B(2,2) \xrightarrow[(5,0)]{\text{Trans}} (2+5, 2+0)$ $B(7,2)$

$B(1,1) \xrightarrow[(5,0)]{\text{Trans}} B(1+5, 1+0) = B(6,1) \xrightarrow[s.f]{\text{Dilat}} B(12,2).$

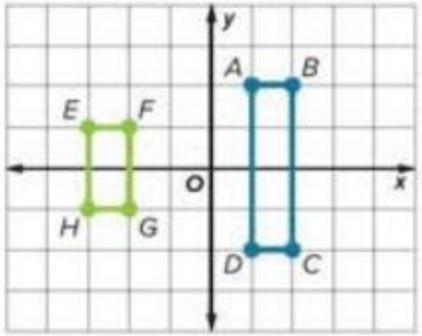
Not the same.

b. Describe a sequence of transformations that maps square *ABCD* onto square *EFGH*, in which the first transformation is a translation.

~~9.~~ Draw a two-dimensional figure on the coordinate plane. Then perform a series of transformations on the figure. Which figures are congruent? Which figures are similar?



10. MP **Find the Error** A student concluded that rectangle *ABCD* is similar to rectangle *EFGH* because a dilation with a scale factor of 0.5 and a translation maps rectangle *ABCD* onto rectangle *EFGH*. Find the student's mistake and correct it.

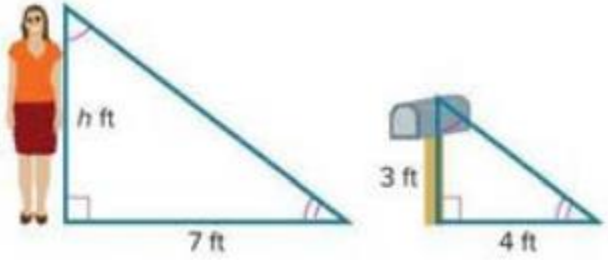


The figs: are not similar

$\frac{AB}{EF} = \frac{1}{1}$

$\frac{BC}{FG} = \frac{4}{2} = 2.$

1. Becky casts a 7-foot shadow at the same time a nearby mailbox casts a 4-foot shadow. If the mailbox is 3 feet tall, how tall is Becky? (Example 1)



1.

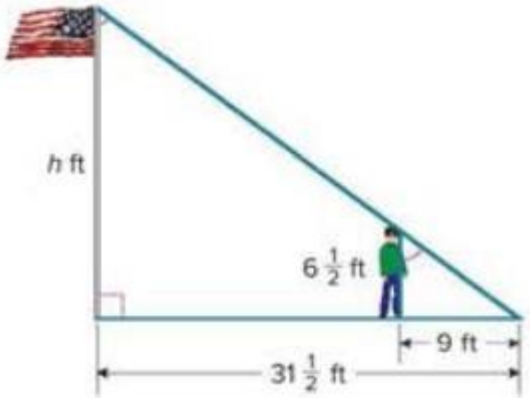
$$\frac{h}{3} = \frac{7}{4}$$

$$4h = 3 \times 7$$

$$h = \frac{21}{4}$$

$$= 5.25 \text{ ft}$$

2. At the same time a $6\frac{1}{2}$-foot tall teacher casts a 9-foot shadow, a nearby flagpole casts a $31\frac{1}{2}$-foot shadow. How tall is the flagpole? (Example 1)



2.

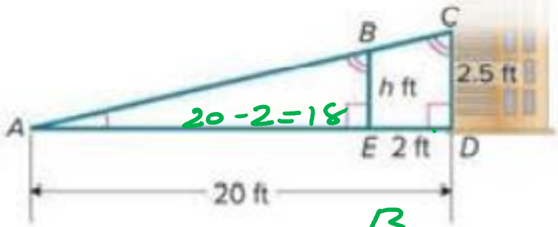
$$\frac{h}{6.5} = \frac{31.5}{9}$$

$$9h = 31.5 \times 6.5$$

$$h = \frac{204.75}{9}$$

$$= 22.75$$

3. In the figure, $\triangle ABE$ is similar to $\triangle ACD$. What is the height h of the ramp when it is 2 feet from the building? (Example 2)

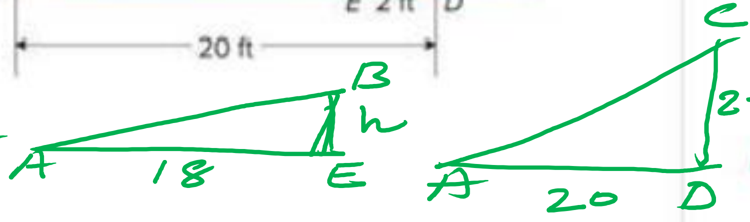


3.

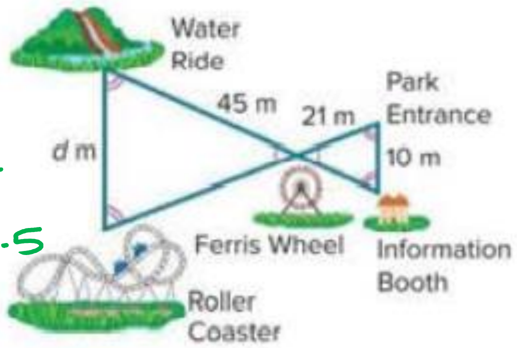
$$\frac{h}{2.5} = \frac{20}{18}$$

$$18h = 2.5 \times 20$$

$$h = \frac{2.5 \times 20}{18} = 2.8 \text{ ft}$$



4. In the figure, the triangles are similar. What is the distance d from the water ride to the roller coaster? Round to the nearest tenth. (Example 2)



4.

$$\frac{d}{10} = \frac{45}{21}$$

$$21d = 10 \times 45$$

$$d = \frac{10 \times 45}{21}$$

$$= 21.4 \text{ m}$$