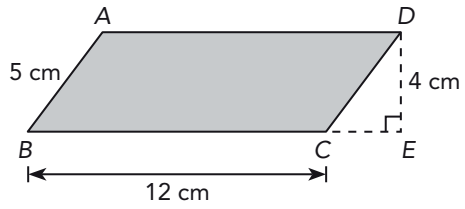
Name: _____ Date: _____

Lesson 10.2 Area of Parallelograms and Trapezoids

Find the area of each parallelogram.

Example

In the figure, *ABCD* is a parallelogram. Find the area of parallelogram *ABCD*.



Base = BC = 12 cm

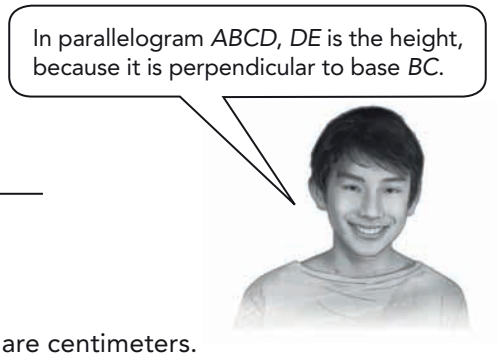
Height = DE = 4 cm

Area of parallelogram *ABCD* = *bh*

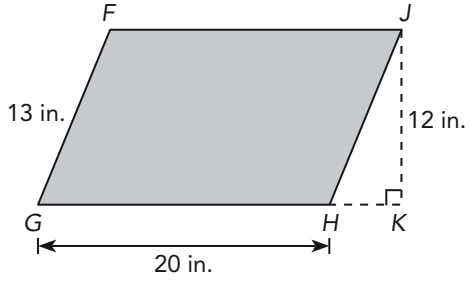
= 12 · 4

= 48 cm^2

The area of parallelogram *ABCD* is 48 square centimeters.



1. In the figure, *FGHJ* is a parallelogram. Find the area of parallelogram *FGHJ*.



Base = _____ = _____ in.

Height = _____ = _____ in.

Area of parallelogram *FGHJ* = *bh*

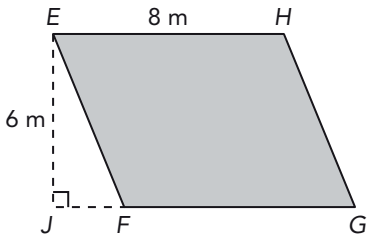
= _____ · _____

= _____ in.^{2}

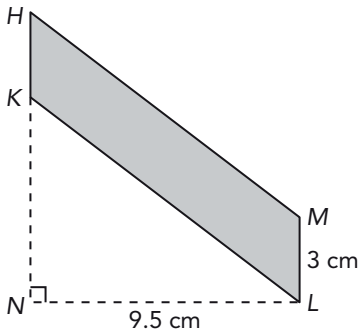
The area of parallelogram *FGHJ* is _____ square inches.

Name: _____ Date: _____

2.



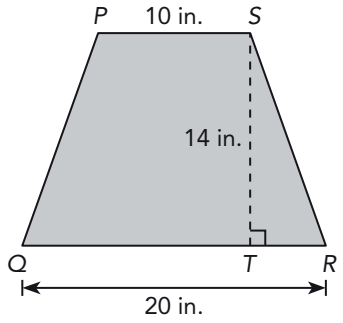
3.



Find the area of each trapezoid.

Example

In the figure, *PQRS* is a trapezoid. $\overline{PS}$ is parallel to $\overline{QR}$. *ST* is the height of the trapezoid. Find the area of *PQRS*.



Height = ST = 14 in.

Sum of bases = PS + QR

= 10 + 20

= 30 in.

Area of trapezoid *PQRS* = $\frac{1}{2}h(b_1 + b_2)$

= $\frac{1}{2}$ · 14 · 30

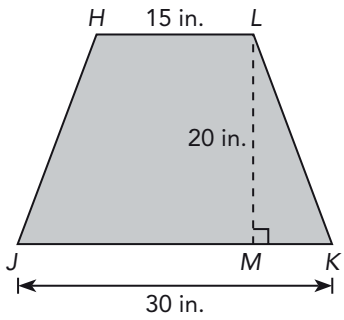
= 210 in.^{2}

The bases of a trapezoid are parallel.

The area of trapezoid *PQRS* is 210 square inches.

Name: _____ Date: _____

4. In the figure, *HJKL* is a trapezoid. $\overline{HL}$ is parallel to $\overline{JK}$. *LM* is the height of the trapezoid. Find the area of *HJKL*.



Height = _____ = _____ in.

Sum of bases = _____ + _____

= _____ + _____

= _____ in.

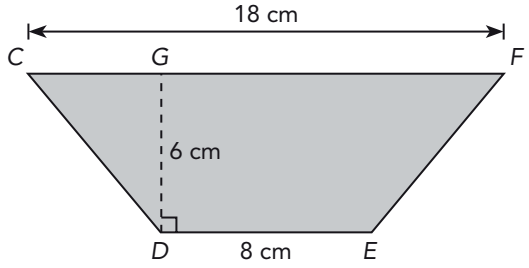
Area of trapezoid *HJKL* = $\frac{1}{2}h(b_1 + b_2)$

= $\frac{1}{2}$ · _____ · _____

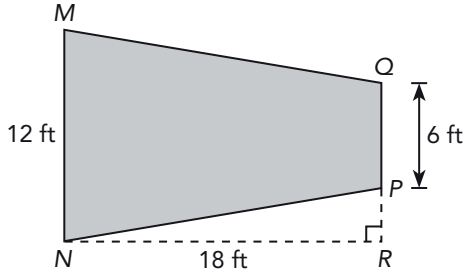
= _____ $in.^2$

The area of trapezoid *HJKL* is _____ square inches.

5.



6.

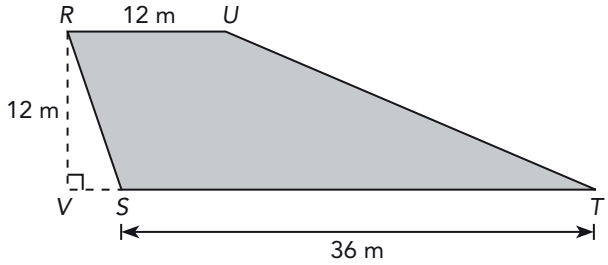


Name: _____ Date: _____

Find the area of each trapezoid.

Example

In the figure, *RSTU* is a trapezoid. $\overline{RU}$ is parallel to $\overline{ST}$. *RV* is the height of the trapezoid. Find the area of *RSTU*.



Height = RV = 12 m

Sum of bases = RU + ST

= 12 + 36

= 48 m

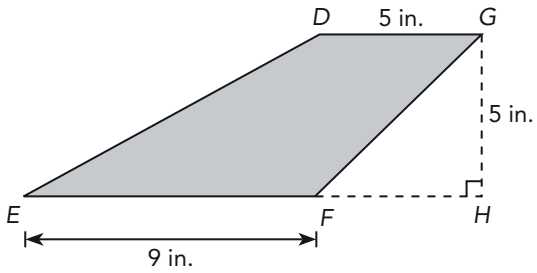
Area of trapezoid *RSTU* = $\frac{1}{2}h(b_1 + b_2)$

= $\frac{1}{2}$ · 12 · 48

= 288 m^2

The area of trapezoid *RSTU* is 288 square meters.

7. In the figure, *DEFG* is a trapezoid. $\overline{DG}$ is parallel to $\overline{EF}$. *GH* is the height of the trapezoid. Find the area of *DEFG*.



Height = _____ = _____ in.

Sum of bases = _____ + _____

= _____ + _____

= _____ in.

Area of trapezoid *DEFG* = $\frac{1}{2}h(b_1 + b_2)$

= $\frac{1}{2}$ · _____ · _____

= _____ $in.^2$

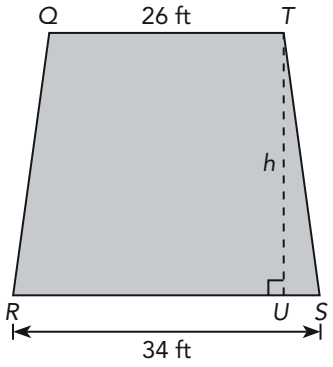
The area of trapezoid *DEFG* is _____ square inches.

Name: _____ Date: _____

Find the height of each trapezoid.

Example

The area of trapezoid *QRST* is 810 square feet. $\overline{QT}$ is parallel to $\overline{RS}$. Find the height of the trapezoid.



Area of trapezoid $QRST = \frac{1}{2}h(b_1 + b_2)$

$810 = \frac{1}{2} \cdot h \cdot (26 + 34)$

$810 = \frac{1}{2} \cdot h \cdot 60$

$810 = \frac{1}{2} \cdot 60 \cdot h$

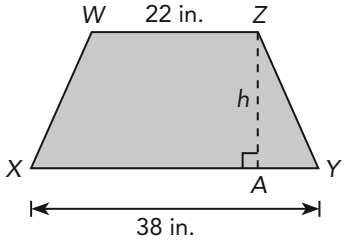
$810 = 30 \cdot h$

$810 \div 30 = 30 \cdot h \div 30$

$27 = h$

The height of trapezoid *QRST* is 27 feet.

8. The area of trapezoid *WXYZ* is 540 square inches. $\overline{WZ}$ is parallel to $\overline{XY}$. Find the height of the trapezoid.



Area of trapezoid $WXYZ = \frac{1}{2}h(b_1 + b_2)$

_____ $= \frac{1}{2} \cdot h \cdot$ (_____ + _____)

_____ $= \frac{1}{2} \cdot h \cdot$ _____

_____ $= \frac{1}{2} \cdot$ _____ $\cdot h$

_____ = _____ $\cdot h$

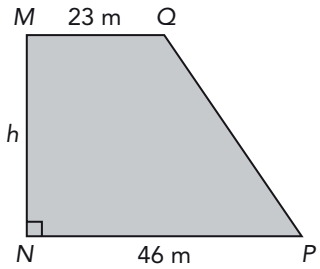
_____ $\div$ _____ = _____ $\cdot h \div$ _____

_____ $= h$

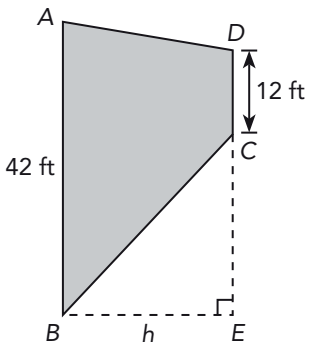
The height of trapezoid *WXYZ* is _____ inches.

Name: _____ Date: _____

9. The area of trapezoid *MNPQ* is 1,173 square meters.



10. The area of trapezoid *ABCD* is 621 square feet.

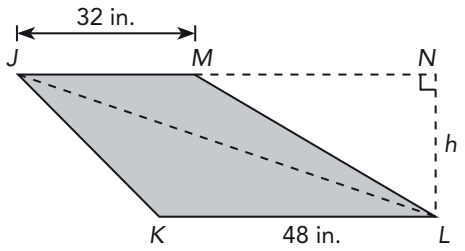


Name: _____ Date: _____

Solve. Show your work.

Example

The area of trapezoid *JKLM* is 1,000 square inches. $\overline{JM}$ is parallel to $\overline{KL}$.



a) Find the height of trapezoid *JKLM*.

Area of trapezoid *JKLM* = $\frac{1}{2}h(b_1 + b_2)$

1,000 = $\frac{1}{2}$ · *h* · (32 + 48)

1,000 = $\frac{1}{2}$ · *h* · 80

1,000 = $\frac{1}{2}$ · 80 · *h*

1,000 = 40 · *h*

1,000 ÷ 40 = 40 · *h* ÷ 40

25 = *h*

The height of trapezoid *JKLM* is 25 inches.

b) Find the area of triangle *JLM*.

Height of triangle *JLM* = NL = 25 in.

Area of triangle *JLM* = $\frac{1}{2}bh$

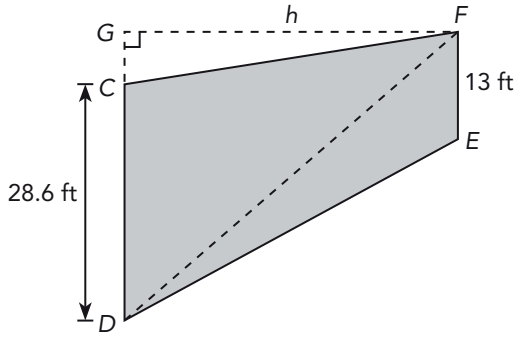
= $\frac{1}{2}$ · 32 · 25

= 400 in.^{2}

The area of triangle *JLM* is 400 square inches.

Name: _____ Date: _____

11. The area of trapezoid *CDEF* is 832 square feet. $\overline{CD}$ is parallel to $\overline{FE}$.



a) Find the height of trapezoid *CDEF*.

Area of trapezoid *CDEF* = $\frac{1}{2}h(b_1 + b_2)$

_____ = $\frac{1}{2}$ · *h* · (_____ + _____)

_____ = $\frac{1}{2}$ · *h* · _____

_____ = $\frac{1}{2}$ · _____ · *h*

_____ = _____ · *h*

_____ ÷ _____ = _____ · *h* ÷ _____

_____ = *h*

The height of trapezoid *CDEF* is _____ feet.

b) Find the area of triangle *FDE*.

Area of triangle *FDE* = $\frac{1}{2}bh$

= $\frac{1}{2}$ · _____ · _____

= _____ ft^2

The area of triangle *FDE* is _____ square feet.

3. trapezoid
$\overline{PS}$ is parallel to $\overline{QR}$.

4. parallelogram
$\overline{AD}$ is parallel to $\overline{BC}$.
$\overline{AB}$ is parallel to $\overline{DC}$.

5. trapezoid
$\overline{DG}$ is parallel to $\overline{EF}$.

6. rhombus
$\overline{KJ}$ is parallel to $\overline{MN}$.
$\overline{JN}$ is parallel to $\overline{KM}$.

7. Area $= \ell w$
$= \underline{13} \times \underline{9}$
$= \underline{117}$ in.^{2}
The area of the rectangle is $\underline{117}$ square inches.

8. Area $= \ell w$
$= \underline{20} \times \underline{14}$
$= \underline{280}$ m^2
The area of the rectangle is $\underline{280}$ square meters.

9. Area $= \ell^2$
$= \underline{5} \times \underline{5}$
$= \underline{25}$ cm^2
The area of the square is $\underline{25}$ square centimeters.

10. Area $= \ell^2$
$= \underline{11} \times \underline{11}$
$= \underline{121}$ ft^2
The area of the square is $\underline{121}$ square feet.

11. Base $= \underline{YZ} = \underline{20}$ cm
Height $= \underline{XW} = \underline{15}$ cm
Area of triangle $= \frac{1}{2}bh$
$= \frac{1}{2} \cdot \underline{20} \cdot \underline{15}$
$= \underline{150}$ cm^2
The area of triangle *XYZ* is $\underline{150}$ square centimeters.

12. 84 square feet

13. 130 square meters

14. Base $= \underline{ST} = \underline{8}$ in.
Height $= \underline{RU} = \underline{3.6}$ in.
Area of triangle $= \frac{1}{2}bh$
$= \frac{1}{2} \cdot \underline{8} \cdot \underline{3.6}$
$= \underline{14.4}$ in.^{2}
The area of triangle *RST* is $\underline{14.4}$ square inches.

15. 24 square feet

16. 37.8 square meters

17. Area of triangle $STU = \frac{1}{2}bh$
$\underline{108} = \frac{1}{2} \cdot \underline{24} \cdot h$
$\underline{108} = \underline{12} \cdot h$
$\underline{108} \div \underline{12} = \underline{12} \cdot h \div \underline{12}$
$\underline{9} = h$
The height of triangle *STU* is $\underline{9}$ inches.

18. 20 centimeters

19. 24 feet

20. Area of triangle $GHJ = \frac{1}{2}bh$
$\underline{286} = \frac{1}{2} \cdot b \cdot \underline{26}$
$\underline{286} = \frac{1}{2} \cdot \underline{26} \cdot b$
$\underline{286} = \underline{13} \cdot h$
$\underline{286} \div \underline{13} = \underline{13} \cdot h \div \underline{13}$
$\underline{22} = h$
The base of triangle *GHJ* is $\underline{22}$ inches.

21. 16 centimeters

22. 14 meters

Lesson 10.2

1. Base $= \underline{GH} = \underline{20}$ in.
Height $= \underline{JK} = \underline{12}$ in.
Area of parallelogram $FGHJ = bh$
$= \underline{20} \cdot \underline{12}$
$= \underline{240}$ in.^{2}
The area of parallelogram *FGHJ* is $\underline{240}$ square inches.

2. 48 square meters

3. 28.5 square centimeters

4. Height $= \underline{LM} = \underline{20}$ in.
Sum of bases $= \underline{HL} + \underline{JK}$
$= \underline{15} + \underline{30}$
$= \underline{45}$ in.
Area of trapezoid *HJKL*
$= \frac{1}{2}h(b_1 + b_2)$
$= \frac{1}{2} \cdot \underline{20} \cdot \underline{45}$
$= \underline{450}$ in.^{2}
The area of trapezoid *HJKL* is $\underline{450}$ square inches.

5. 78 square centimeters

6. 162 square feet

7. Height $= \underline{GH} = \underline{5}$ in.
Sum of bases $= \underline{DG} + \underline{EF}$
$= \underline{5} + \underline{9}$
$= \underline{14}$ in.
Area of trapezoid *DEFG*
$= \frac{1}{2}h(b_1 + b_2)$
$= \frac{1}{2} \cdot \underline{5} \cdot \underline{14}$
$= \underline{35}$ in.^{2}
The area of trapezoid *DEFG* is $\underline{35}$ square inches.

8. Area of trapezoid $WXYZ = \frac{1}{2}h(b_1 + b_2)$

$$\underline{540} = \frac{1}{2} \cdot h \cdot (\underline{22} + \underline{38})$$
$$\underline{540} = \frac{1}{2} \cdot h \cdot \underline{60}$$
$$\underline{540} = \frac{1}{2} \cdot \underline{60} \cdot h$$
$$\underline{540} = \underline{30} \cdot h$$
$$\underline{540} \div \underline{30} = \underline{30} \cdot h \div \underline{30}$$
$$\underline{18} = h$$

The height of trapezoid *WXYZ* is 18 inches.

9. 34 meters **10.** 23 feet

11. a) Area of trapezoid $CDEF = \frac{1}{2}h(b_1 + b_2)$

$$\underline{832} = \frac{1}{2} \cdot h \cdot (\underline{28.6} + \underline{13})$$
$$\underline{832} = \frac{1}{2} \cdot h \cdot \underline{41.6}$$
$$\underline{832} = \frac{1}{2} \cdot \underline{41.6} \cdot h$$
$$\underline{832} = \underline{20.8} \cdot h$$
$$\underline{832} \div \underline{20.8} = \underline{20.8} \cdot h \div \underline{20.8}$$
$$\underline{40} = h$$

The height of trapezoid *CDEF* is 40 feet.

b) Area of triangle $FDE = \frac{1}{2}bh$

$$= \frac{1}{2} \cdot \underline{13} \cdot \underline{40}$$
$$= \underline{260} \text{ ft}^2$$

The area of triangle *FDE* is 260 square feet.

Lesson 10.3

1. Area of triangle $= \frac{1}{2}bh$

$$= \frac{1}{2} \cdot \underline{14} \cdot \underline{9.6}$$
$$= \underline{67.2} \text{ cm}^2$$

Area of pentagon
$= \underline{5} \cdot$ area of triangle
$= \underline{5} \times \underline{67.2}$
$= \underline{336} \text{ cm}^2$

The area of the pentagon is 336 square centimeters.

2. 97.5 square inches

3. Area of triangle $= \frac{1}{2}bh$

$$= \frac{1}{2} \cdot \underline{20} \cdot \underline{17.3}$$
$$= \underline{173} \text{ cm}^2$$

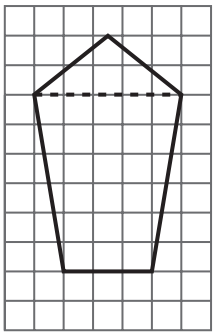
Area of hexagon
$= \underline{6} \cdot$ area of triangle
$= \underline{6} \times \underline{173}$
$= \underline{1{,}038} \text{ cm}^2$

The area of the tablemat is 1,038 square centimeters.

4. 940.5 square inches

Lesson 10.4

1.



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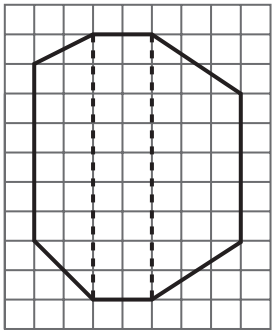

3. a) Area of square $= \ell^2$

$$\underline{81} = \ell^2$$
$$\underline{\sqrt{81}} = \ell$$
$$\underline{9} = \ell$$

Area of triangle $= \frac{1}{2}bh$

$$= \frac{1}{2} \cdot \underline{15} \cdot \underline{9}$$
$$= \underline{67.5} \text{ ft}^2$$

The area of the triangle *NPQ* is 67.5 square feet.

b) Area of trapezoid *MPQR*
= area of square *MNQR* + area of triangle *NPQ*
$= \underline{81} + \underline{67.5}$
$= \underline{148.5} \text{ ft}^2$

The area of trapezoid *MPQR* is 148.5 square feet.

4. a) 7 inches

b) 49 square inches

c) 105 square inches

5. Area of trapezoid $STVY = \frac{1}{2}h(b_1 + b_2)$

$$\underline{242} = \frac{1}{2} \cdot h \cdot (\underline{18} + \underline{18} + \underline{8})$$
$$\underline{242} = \frac{1}{2} \cdot h \cdot \underline{44}$$
$$\underline{242} = \frac{1}{2} \cdot \underline{44} \cdot h$$
$$\underline{242} = \underline{22} \cdot h$$
$$\underline{242} \div \underline{22} = \underline{22} \cdot h \div \underline{22}$$
$$\underline{11} = h$$