

SCAVENGER HUNT



PERIMETER AND AREA ON THE COORDINATE PLANE

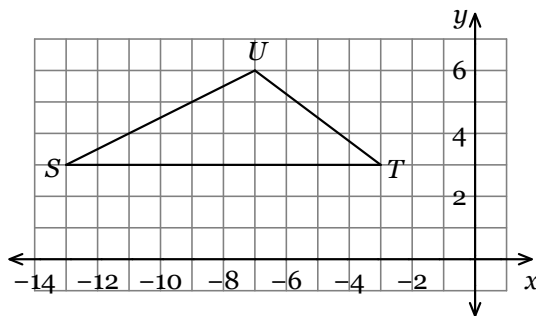
Perimeter or Area? Figures on the Coordinate Plane

A figure on every card · exact perimeters · areas in square units · the
cards check the answers

FREE

ANSWER

$$26 + 3\sqrt{2} \text{ units}$$



Triangle STU has corners $S(-13, 3)$,
 $T(-3, 3)$ and $U(-7, 6)$.

Find its area.

Area in square units.

*A slant side can be a whole number long. It is
still not the height.*

G

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1. **Tape the 16 cards around the room**, in any order. Each card has a large letter in its bottom left corner. Start each group at a *different* one of these eight cards: *G L J N Q C P E*.
2. **Say this once:** “*Read what your card asks: the area or the perimeter. Find it from the corners. A perimeter is exact, like $12 + 2\sqrt{13}$. An area is in square units. Then walk to the card with that answer at the top.*”
3. **Each group writes one line per card.** Eight right answers bring the group back to its first card.

16 cards	pages 3–10, one copy. There are two cards on each sheet. Cut the whole stack once.
Record sheet	page 11, one per student. It shows a base, its height and a slant side.
Answers	pages 12–13, for you only. Do not put them up in the room.

Every card shows one figure on the coordinate plane, with its corners printed. Area cards and perimeter cards take turns, so a group must read each question. On a perimeter card, a side along a grid line is found by subtracting two coordinates, and the one slant side by the distance formula. The perimeter stays exact, a whole number plus a square root. On an area card the figure is a triangle with one side along a grid line. The height is a difference of coordinates, straight up, down or across from that side, so a correct area never has a square root. No calculator is needed.

Eight of the sixteen cards make the ring. A group reaches the other eight only by a wrong answer, but all the cards look the same. There are two mistakes. On an area card, the student uses a slant side as the height. On a perimeter card, the student leaves out the slant side. Each of these lands on a card off the ring. That card sends the group back to the card it got wrong. On card G the slant side is 5 long, a whole number, so the wrong area has no square root in it. Checking for a square root does not catch every mistake.

The check is the length of the group’s list. A clean run is **eight lines**. Each wrong answer adds two. Every card has a line in italics under its question. It tells a group that arrived by a wrong answer what to check. A group that arrived by a right answer skips it. Guessing does not work: no simple rule gets more than six of the cards. If a group keeps coming back to the same cards, ask: “*Which side is the base? Where is the height, and does it meet the base line at a right angle? Did you add every side?*”

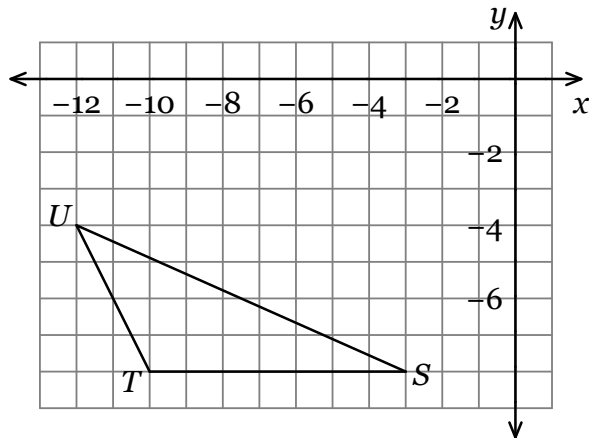


This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.

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ANSWER

18 units



Triangle STU has corners $S(-3, -8)$, $T(-10, -8)$ and $U(-12, -4)$.

Find its area.

Area in square units.

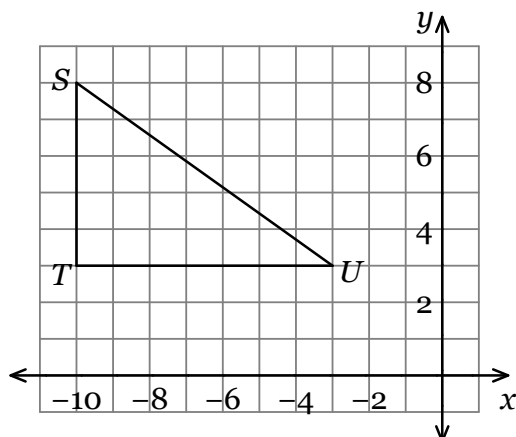
Walk around the figure with a finger. Every side goes into the perimeter.

A

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ANSWER

$7\sqrt{5}$ square units



Triangle STU has corners $S(-10, 8)$, $T(-10, 3)$ and $U(-3, 3)$.

Find its perimeter.

Perimeter exact, in units.

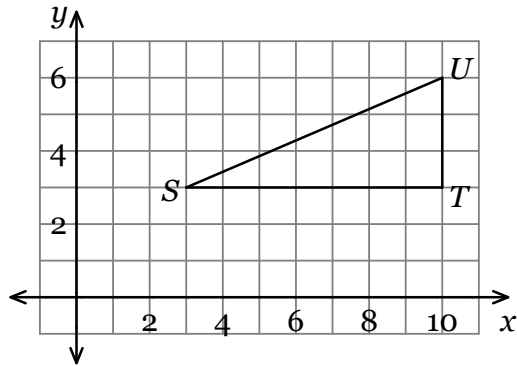
A height on this grid is a difference of two coordinates. Is a square root in the area?

B

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ANSWER

27 square units



Triangle STU has corners $S(3, 3)$, $T(10, 3)$ and $U(10, 6)$.

Find its perimeter.

Perimeter exact, in units.

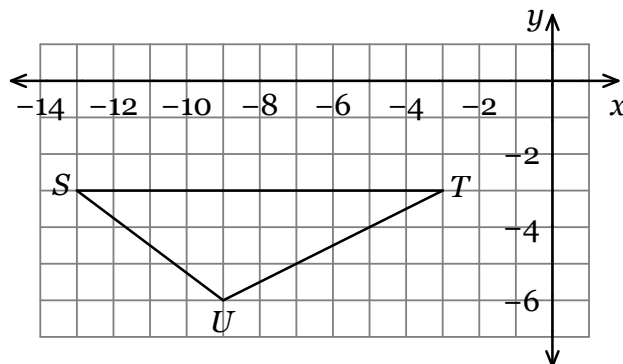
*Count the sides of the figure. Count the lengths in the sum.
Do they match?*

C

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ANSWER

12 units



Triangle STU has corners $S(-13, -3)$, $T(-3, -3)$ and $U(-9, -6)$.

Find its area.

Area in square units.

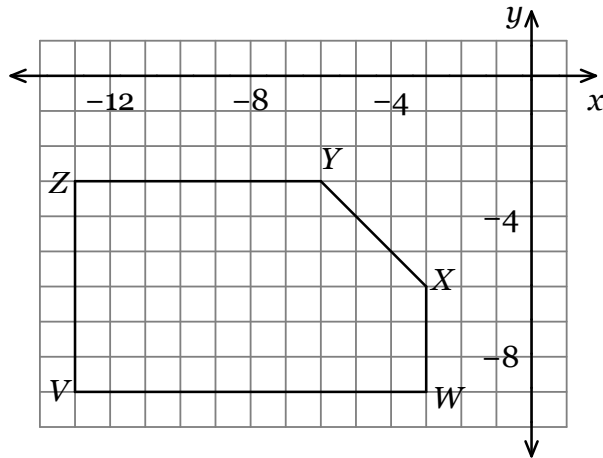
Is the sum missing a side? A perimeter adds every side, slant ones too.

D

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ANSWER

21 square units



Pentagon VWXYZ has corners $V(-13, -9)$, $W(-3, -9)$, $X(-3, -6)$, $Y(-6, -3)$ and $Z(-13, -3)$.

Find its perimeter.

Perimeter exact, in units.

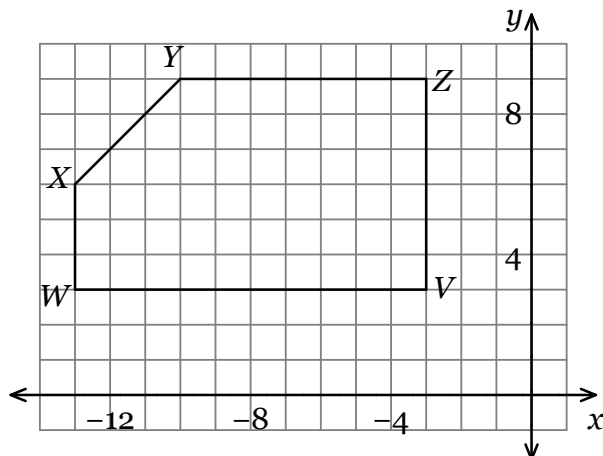
Name each side in turn, all the way around. Then add every length.

E

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ANSWER

25 square units



Pentagon VWXYZ has corners $V(-3, 3)$, $W(-13, 3)$, $X(-13, 6)$, $Y(-10, 9)$ and $Z(-3, 9)$.

Find its perimeter.

Perimeter exact, in units.

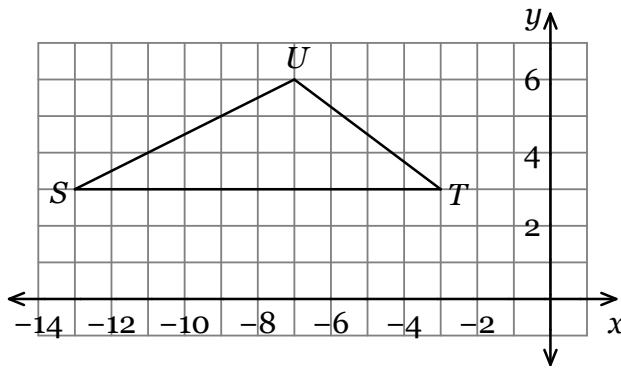
Find the base on a grid line. Does the height meet its line at a right angle?

F

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ANSWER

$$26 + 3\sqrt{2} \text{ units}$$



Triangle STU has corners $S(-13, 3)$, $T(-3, 3)$ and $U(-7, 6)$.

Find its area.

Area in square units.

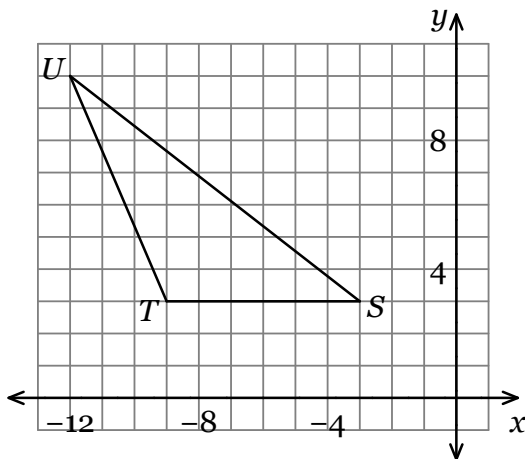
A slant side can be a whole number long. It is still not the height.

G

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ANSWER

$$26 \text{ units}$$



Triangle STU has corners $S(-3, 3)$, $T(-9, 3)$ and $U(-12, 10)$.

Find its area.

Area in square units.

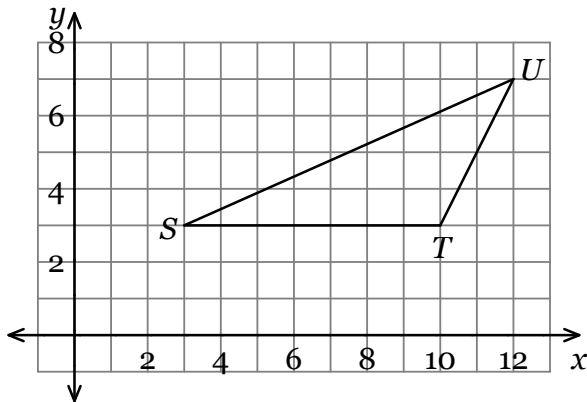
How many sides does the figure have? Is each one in the sum?

H

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ANSWER

$$12 + \sqrt{74} \text{ units}$$



Triangle STU has corners $S(3, 3)$, $T(10, 3)$ and $U(12, 7)$.

Find its area.

Area in square units.

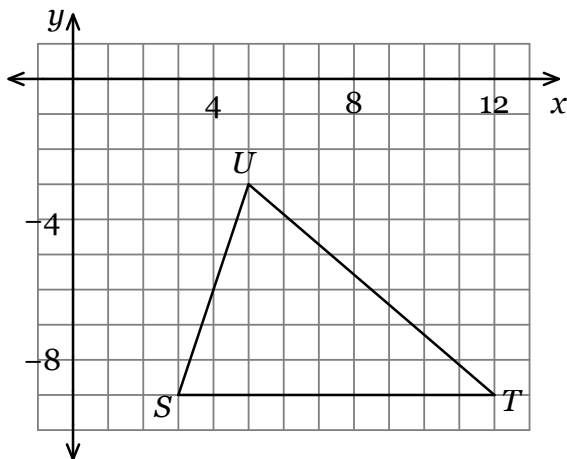
Is a square root in the area? Then a slant side is in it, and the height is not.

J

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ANSWER

$$10 \text{ units}$$



Triangle STU has corners $S(3, -9)$, $T(12, -9)$ and $U(5, -3)$.

Find its area.

Area in square units.

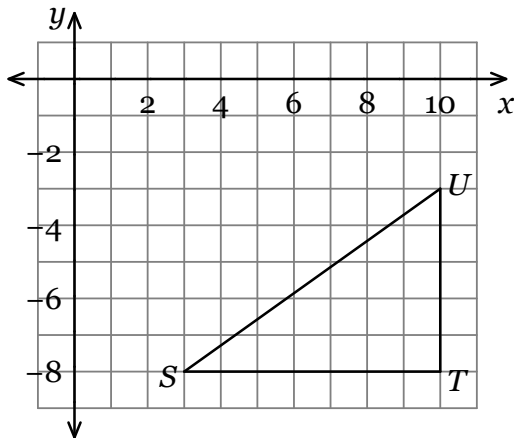
List the sides. Which one slants? Its length belongs in the sum.

K

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ANSWER

15 square units



Triangle STU has corners $S(3, -8)$, $T(10, -8)$ and $U(10, -3)$.

Find its perimeter.

Perimeter exact, in units.

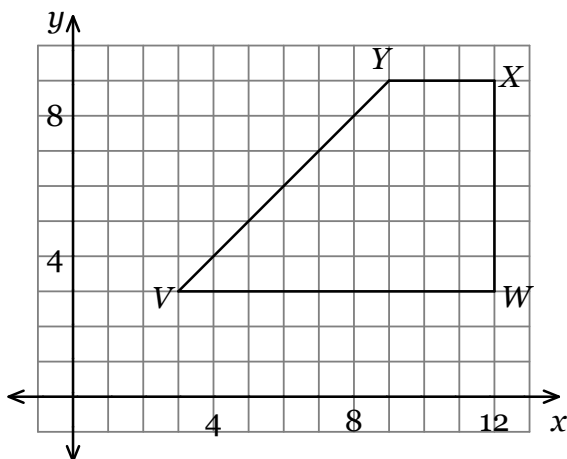
Go all the way around the figure. Is every side in the sum?

L

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ANSWER

$9\sqrt{10}$ square units



Quadrilateral VWXY has corners $V(3, 3)$, $W(12, 3)$, $X(12, 9)$ and $Y(9, 9)$.

Find its perimeter.

Perimeter exact, in units.

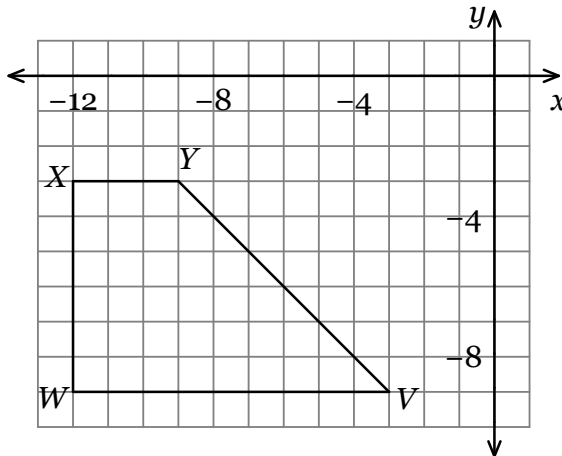
Use the base and the height. A slant side is never the height.

M

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ANSWER

14 square units



Quadrilateral VWXY has corners $V(-3, -9)$, $W(-12, -9)$, $X(-12, -3)$ and $Y(-9, -3)$.

Find its perimeter.

Perimeter exact, in units.

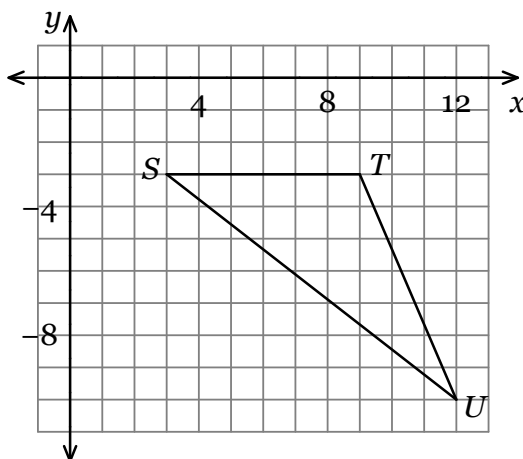
The slant side counts in the perimeter too. Its length is $\sqrt{(\text{across}^2 + \text{up}^2)}$.

N

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ANSWER

$10 + \sqrt{58}$ units



Triangle STU has corners $S(3, -3)$, $T(9, -3)$ and $U(12, -10)$.

Find its area.

Area in square units.

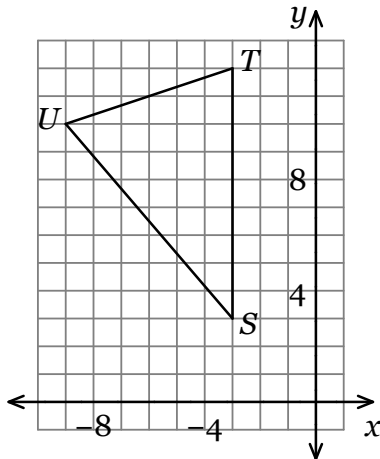
Count the height on the grid, from the base line to the far corner.

P

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ANSWER

$$18 + 6\sqrt{2} \text{ units}$$



Triangle STU has corners $S(-3, 3)$, $T(-3, 12)$ and $U(-9, 10)$.

Find its area.

Area in square units.

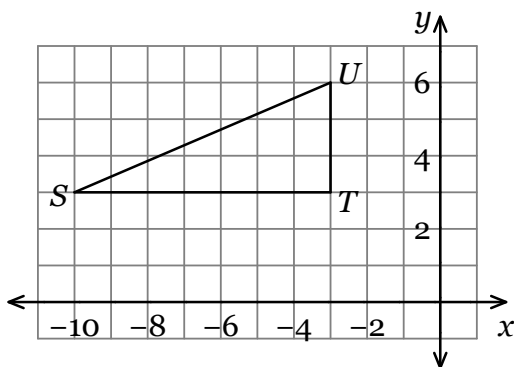
The height meets the base line at a right angle. A slant side does not.

Q

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ANSWER

$$3\sqrt{58} \text{ square units}$$



Triangle STU has corners $S(-10, 3)$, $T(-3, 3)$ and $U(-3, 6)$.

Find its perimeter.

Perimeter exact, in units.

Is a square root in the area? Count the height from the base line instead.

R

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Scavenger Hunt — where I went

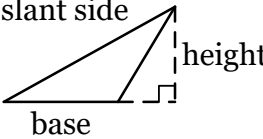
Perimeter and area

Name _____

Period _____

Date _____

For each card, circle what it asks: area or perimeter. **A perimeter is exact, like $12 + 2\sqrt{13}$, in units. Do not use a decimal. An area is in square units.** Then find the card with your answer at the top. A clean run is eight lines. Each card has a line in italics under its question. **If you are on a card because you went wrong, its line says what to check. If you were right, skip it.**



Perimeter is the length all the way around, in units. Add every side. Leave it exact, in simplest radical form ($\sqrt{20} = \sqrt{4 \times 5} = 2\sqrt{5}$), like $12 + 2\sqrt{13}$. Do not use a decimal.

A side along a grid line: subtract two coordinates. A slant side: $\sqrt{(\text{across}^2 + \text{up}^2)}$.

Area is the space inside, in square units. Rectangle: $\text{base} \times \text{height}$. Triangle: $\frac{1}{2} \times \text{base} \times \text{height}$. The height goes straight up, down or across from the base line to the opposite corner. A slant side is never the height. An area never needs a square root here.

Card letter	Which?	Work	Answer and units
1	area / perimeter		
2	area / perimeter		
3	area / perimeter		
4	area / perimeter		
5	area / perimeter		
6	area / perimeter		
7	area / perimeter		
8	area / perimeter		
9	area / perimeter		
10	area / perimeter		

The rug covers the whole floor. What does the rug call the fence?

Every number stands for a letter. Write the letter for each answer in the box above its number. Read the boxes you filled, left to right. **If they do not spell the answer, one of your answers is wrong.**

10 = S 12 = I 14 = O 15 = U $7\sqrt{5}$ = O $10 + \sqrt{58}$ = T 18 = E $12 + \sqrt{74}$ = S 21 = I $3\sqrt{58}$ = T 25 = U 26 = R
 $18 + 6\sqrt{2}$ = D 27 = E $9\sqrt{10}$ = D $26 + 3\sqrt{2}$ = R

10	12	14	15	$7\sqrt{5}$	$10 + \sqrt{58}$	18	$12 + \sqrt{74}$	21	$3\sqrt{58}$	25	26	$18 + 6\sqrt{2}$	27	$9\sqrt{10}$	$26 + 3\sqrt{2}$



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Scavenger Hunt — answers

For the teacher

The ring in order, with the answer found on each card. A group may begin anywhere on it. Wherever it begins, eight right answers bring it back to that card.

G (15) → L (12 + $\sqrt{74}$) → J (14) → N (18 + $6\sqrt{2}$) → Q (27) → C (10 + $\sqrt{58}$) → P (21) → E (26 + $3\sqrt{2}$) → G

The rug covers the whole floor. What does the rug call the fence? The answer is *OUTSIDER!* It is read along the boxes of the record sheet, which run from the smallest number to the largest.

Card	The figure and the question	Answer, and why	The common wrong answer on this card, and why	Letter of its top
1 G	Triangle STU: S(-13, 3), T(-3, 3), U(-7, 6). Area.	15 square units. Base ST is along a grid line: $-3 - (-13) = 10$ (the x-coordinates). The height goes straight up from the base line to U: $6 - 3 = 3$ (the y-coordinates). Area = $\frac{1}{2} \times 10 \times 3 = 15$ square units.	25. The slant side UT = 5 is used as the height: $\frac{1}{2} \times 10 \times 5 = 25$. The height is 3. No square root shows, but the 5 is a slant side.	R
2 L	Triangle STU: S(3, -8), T(10, -8), U(10, -3). Perimeter.	12 + $\sqrt{74}$ units. ST = 7, TU = 5, US = $\sqrt{7^2 + 5^2} = \sqrt{74}$ (distance formula). Perimeter = $12 + \sqrt{74}$ units.	12. The slant side US is left out: $7 + 5 = 12$. A perimeter adds every side.	U
3 J	Triangle STU: S(3, 3), T(10, 3), U(12, 7). Area.	14 square units. Base ST is along a grid line: $10 - 3 = 7$ (the x-coordinates). The height goes straight up from the base line to U: $7 - 3 = 4$ (the y-coordinates). U is past the end of the base, and the height is still measured from the base line. Area = $\frac{1}{2} \times 7 \times 4 = 14$ square units.	$7\sqrt{5}$. The slant side UT = $\sqrt{20}$ is used as the height: $\frac{1}{2} \times 7 \times \sqrt{20} = 7\sqrt{5}$. The height is 4. A correct area here never has a square root.	S
4 N	Quadrilateral VWXY: V(-3, -9), W(-12, -9), X(-12, -3), Y(-9, -3). Perimeter.	18 + $6\sqrt{2}$ units. VW = 9, WX = 6, XY = 3, YV = $\sqrt{6^2 + 6^2} = 6\sqrt{2}$ (distance formula). Perimeter = $18 + 6\sqrt{2}$ units.	18. The slant side YV is left out: $9 + 6 + 3 = 18$. A perimeter adds every side.	O
5 Q	Triangle STU: S(-3, 3), T(-3, 12), U(-9, 10). Area.	27 square units. Base ST is along a grid line: $12 - 3 = 9$ (the y-coordinates). The height goes straight across from the base line to U: $-3 - (-9) = 6$ (the x-coordinates). Area = $\frac{1}{2} \times 9 \times 6 = 27$ square units.	$9\sqrt{10}$. The slant side UT = $\sqrt{40}$ is used as the height: $\frac{1}{2} \times 9 \times \sqrt{40} = 9\sqrt{10}$. The height is 6. A correct area here never has a square root.	D
6 C	Triangle STU: S(3, 3), T(10, 3), U(10, 6). Perimeter.	10 + $\sqrt{58}$ units. ST = 7, TU = 3, US = $\sqrt{7^2 + 3^2} = \sqrt{58}$ (distance formula). Perimeter = $10 + \sqrt{58}$ units.	10. The slant side US is left out: $7 + 3 = 10$. A perimeter adds every side.	E
7 P	Triangle STU: S(3, -3), T(9, -3), U(12, -10). Area.	21 square units. Base ST is along a grid line: $9 - 3 = 6$ (the x-coordinates). The height goes straight down from the base line to U: $-3 - (-10) = 7$ (the y-coordinates). U is past the end of the base, and the height is still measured from the base line. Area = $\frac{1}{2} \times 6 \times 7 = 21$ square units.	$3\sqrt{58}$. The slant side UT = $\sqrt{58}$ is used as the height: $\frac{1}{2} \times 6 \times \sqrt{58} = 3\sqrt{58}$. The height is 7. A correct area here never has a square root.	T
8 E	Pentagon VWXYZ: V(-13, -9), W(-3, -9), X(-3, -6), Y(-6, -3), Z(-13, -3). Perimeter.	26 + $3\sqrt{2}$ units. VW = 10, WX = 3, XY = $\sqrt{3^2 + 3^2} = 3\sqrt{2}$ (distance formula), YZ = 7, ZV = 6. Perimeter = $26 + 3\sqrt{2}$ units.	26. The slant side XY is left out: $10 + 3 + 7 + 6 = 26$. A perimeter adds every side.	I

Scavenger Hunt — the cards off the ring

For the teacher

A group reaches these eight cards only by a wrong answer. The number at the top of each one is the wrong answer from one ring card. Its right answer is the number at the top of that ring card, so the group goes to the card it got wrong and tries it again. Each of these cards shows the figure of a ring card, moved to another place on the plane, so if the group makes the same mistake here, it goes to another card off the ring. A second wrong answer never moves a group forward.

Card	The figure and the question	Answer, and why	The common wrong answer on this card, and why	Letter of its top
F	Pentagon VWXYZ: V(-3, 3), W(-13, 3), X(-13, 6), Y(-10, 9), Z(-3, 9). Perimeter.	26 + 3√2 units. VW = 10, WX = 3, XY = $\sqrt{(3^2 + 3^2)} = 3\sqrt{2}$ (distance formula), YZ = 7, ZV = 6. Perimeter = 26 + 3√2 units.	26. The slant side XY is left out: 10 + 3 + 7 + 6 = 26. A perimeter adds every side.	U
D	Triangle STU: S(-13, -3), T(-3, -3), U(-9, -6). Area.	15 square units. Base ST is along a grid line: -3 - (-13) = 10 (the x-coordinates). The height goes straight down from the base line to U: -3 - (-6) = 3 (the y-coordinates). Area = $\frac{1}{2} \times 10 \times 3 = 15$ square units.	25. The slant side US = 5 is used as the height: $\frac{1}{2} \times 10 \times 5 = 25$. The height is 3. No square root shows, but the 5 is a slant side.	I
B	Triangle STU: S(-10, 8), T(-10, 3), U(-3, 3). Perimeter.	12 + √74 units. ST = 5, TU = 7, US = $\sqrt{(7^2 + 5^2)} = \sqrt{74}$ (distance formula). Perimeter = 12 + √74 units.	12. The slant side US is left out: 5 + 7 = 12. A perimeter adds every side.	O
A	Triangle STU: S(-3, -8), T(-10, -8), U(-12, -4). Area.	14 square units. Base ST is along a grid line: -3 - (-10) = 7 (the x-coordinates). The height goes straight up from the base line to U: -4 - (-8) = 4 (the y-coordinates). U is past the end of the base, and the height is still measured from the base line. Area = $\frac{1}{2} \times 7 \times 4 = 14$ square units.	7√5. The slant side UT = √20 is used as the height: $\frac{1}{2} \times 7 \times \sqrt{20} = 7\sqrt{5}$. The height is 4. A correct area here never has a square root.	E
M	Quadrilateral VWXY: V(3, 3), W(12, 3), X(12, 9), Y(9, 9). Perimeter.	18 + 6√2 units. VW = 9, WX = 6, XY = 3, YV = $\sqrt{(6^2 + 6^2)} = 6\sqrt{2}$ (distance formula). Perimeter = 18 + 6√2 units.	18. The slant side YV is left out: 9 + 6 + 3 = 18. A perimeter adds every side.	D
K	Triangle STU: S(3, -9), T(12, -9), U(5, -3). Area.	27 square units. Base ST is along a grid line: 12 - 3 = 9 (the x-coordinates). The height goes straight up from the base line to U: -3 - (-9) = 6 (the y-coordinates). Area = $\frac{1}{2} \times 9 \times 6 = 27$ square units.	9√10. The slant side US = √40 is used as the height: $\frac{1}{2} \times 9 \times \sqrt{40} = 9\sqrt{10}$. The height is 6. A correct area here never has a square root.	S
R	Triangle STU: S(-10, 3), T(-3, 3), U(-3, 6). Perimeter.	10 + √58 units. ST = 7, TU = 3, US = $\sqrt{(7^2 + 3^2)} = \sqrt{58}$ (distance formula). Perimeter = 10 + √58 units.	10. The slant side US is left out: 7 + 3 = 10. A perimeter adds every side.	T
H	Triangle STU: S(-3, 3), T(-9, 3), U(-12, 10). Area.	21 square units. Base ST is along a grid line: -3 - (-9) = 6 (the x-coordinates). The height goes straight up from the base line to U: 10 - 3 = 7 (the y-coordinates). U is past the end of the base, and the height is still measured from the base line. Area = $\frac{1}{2} \times 6 \times 7 = 21$ square units.	3√58. The slant side UT = √58 is used as the height: $\frac{1}{2} \times 6 \times \sqrt{58} = 3\sqrt{58}$. The height is 7. A correct area here never has a square root.	R

Other mistakes lead to no card. On an area card: using the other slant side as the height, forgetting the $\frac{1}{2}$, counting grid lines instead of the spaces between them, or giving the perimeter. On a perimeter card: leaving out a different side, counting the slant side as its across or up length, or giving the area. The answer is then not the number at the top of any card.