

SCAVENGER HUNT



INTERIOR AND EXTERIOR ANGLES OF POLYGONS

A Total, or Just One Angle?

Interior and exterior angles on every card · the cards check the answers

FREE

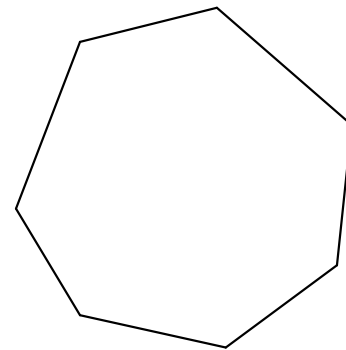
ANSWER

108

This polygon is convex. It has 7 sides.

What is the total of its interior angles?

Count the triangles from one corner, not the sides.



P

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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: *P C E J Q F A M*.
2. **Say this once:** “*Before any arithmetic, write what the card asks for: a total, one angle, or the number of sides. Eight right answers bring you back to your first card.*”
3. **Each group finds the answer, then walks to the card with that number at the top.** Nothing else is needed.

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 the triangles from one corner, the exterior angles, and a regular polygon as three small drawings.
Answers	pages 12–13, for you only. Do not put them up in the room.

There are four kinds of card, mixed together. Some ask for the total of the interior angles. The diagonals from one corner cut a polygon with n sides into $n - 2$ triangles, so the total is $(n - 2) \times 180^\circ$. The common mistake is $n \times 180^\circ$, counting one triangle for each side. Some give that total and ask for the number of sides: divide by 180 to count the triangles, then add 2. The common mistake is to stop at the triangles. Some ask for one interior angle of a regular polygon: the total shared equally. The common mistake is $360 \div n$, which is the exterior angle. Some ask for one exterior angle of a regular polygon: $360 \div n$, because the exterior angles always add up to 360° . The common mistake is to give the interior angle instead.

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. On every ring card, the common mistake gives the number at the top of one of the eight other cards. The group does that card, and its answer sends the group back to the card it got wrong. If the group makes the same mistake there, it goes one more card back and still does not reach the ring.

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 small type under the question. It tells a group that arrived by a wrong answer what to check. A group that arrived by a right answer skips it. If a group keeps coming back to the same cards, do not give the answer. Ask: “*Does the card ask for a total or for one angle? Is the angle inside the polygon or outside it?*”



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ANSWER

120

The interior angles of a convex polygon add up to 2520° .

How many sides does it have?

How many triangles fit? Add two to get the sides.

A

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ANSWER

3600

All 10 sides of a polygon are equal, and all 10 angles are equal.

Find one of its interior angles.

Sharing 360° equally gives an exterior angle, not an interior one.

B

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ANSWER

900

A regular nonagon has 9 equal sides and 9 equal angles.

How big is one exterior angle?

An exterior angle and its interior angle make a straight line.

C

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ANSWER

72

A convex polygon's interior angles have a total of 2520° .

Find the number of sides.

Is the answer the number of triangles, or of sides?

D

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ANSWER

40

The interior angles of a convex polygon add up to 1980° .

How many sides does it have?

The number of triangles is always two less than the number of sides.

E

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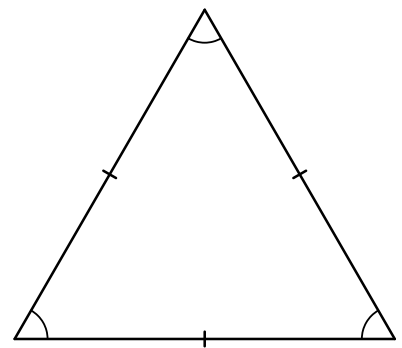
ANSWER

3240

This is an equilateral triangle. It has 3 equal sides and 3 equal angles.

How big is one exterior angle?

Exterior angles can be bigger than a right angle.



F

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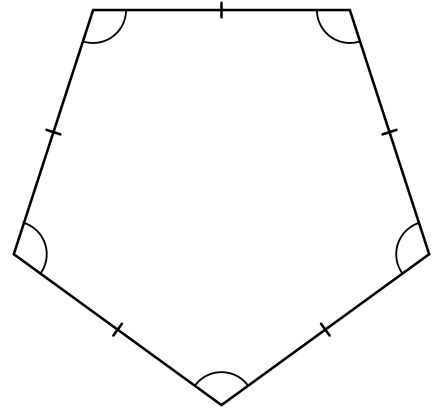
ANSWER

1260

This polygon is regular. Its 5 sides are equal, and its 5 angles are equal.

Find one of its interior angles.

Which angle does the question want: the one inside or the one outside?



G

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ANSWER

60

Picture a convex polygon with 20 sides.

What do all its interior angles add up to?

Do the triangles from one corner number the same as the sides?

H

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ANSWER

13

A regular decagon has 10 equal sides and 10 equal angles.

How big is one interior angle?

Is the question about the angle inside or the angle outside?

J

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ANSWER

11

All 9 sides of a polygon are equal, and all 9 angles are equal.

Find one of its exterior angles.

The exterior angles of any convex polygon add up to 360° .

K

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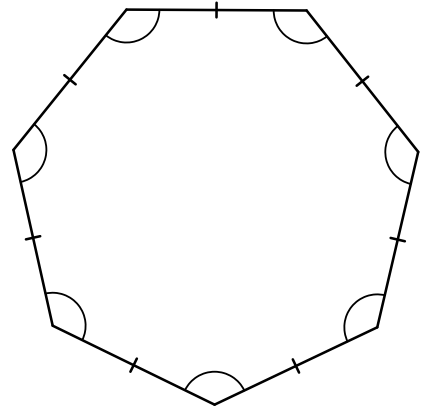
ANSWER

140

This convex polygon has 7 sides.

What do all its interior angles add up to?

A polygon with n sides splits into $n - 2$ triangles from one corner.



L

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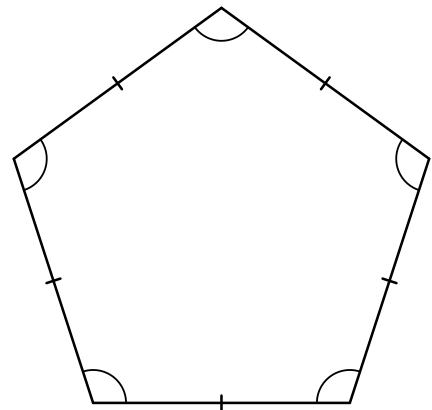
ANSWER

16

This is a regular pentagon. It has 5 equal sides and 5 equal angles.

How big is one interior angle?

One interior angle of a regular polygon is the total split equally.



M

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ANSWER

36

A convex polygon's interior angles have a total of 1980° .

Find the number of sides.

Divide the total by 180 to count triangles, not sides.

N

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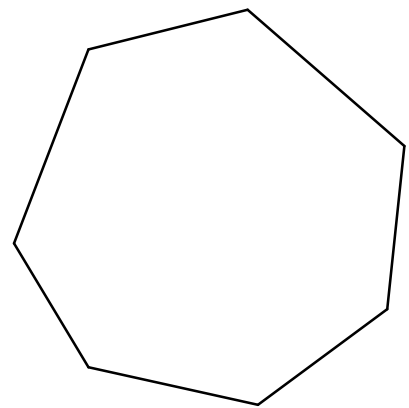
ANSWER

108

This polygon is convex. It has 7 sides.

What is the total of its interior angles?

Count the triangles from one corner, not the sides.



P

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ANSWER

144

A convex polygon has 20 sides. It is too big to draw.

What is the total of its interior angles?

Every interior total is a multiple of 180.

Q

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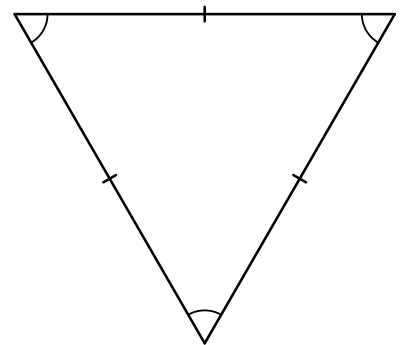
ANSWER

14

This polygon is regular. Its 3 sides are equal, and its 3 angles are equal.

Find one of its exterior angles.

A sharp corner has a large exterior angle.



R

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Scavenger Hunt — where I went

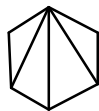
Interior and exterior angles

Name _____

Period _____

Date _____

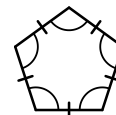
Do the card you are at. Fill in one line. Then find the card with your answer at the top. **Before any arithmetic, write what the card asks for: a total, one angle, or the number of sides.** A clean run is eight lines. Each card has a line in small type under the question. **If you are on a card because you went wrong, its line says what to check. If you were right, skip it.**



From one corner, the diagonals cut a polygon into triangles: **2 fewer than the sides.** So the interior angles add up to $(n - 2) \times 180^\circ$.



One **exterior** angle at every corner: they add up to **360°**, for every polygon.



Regular: all sides equal and all angles equal.

At every corner, the interior angle and the exterior angle add up to 180°.

Card letter	The card asks for (a total, one angle, or the sides)	My answer
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

An ant walks once around a polygon and turns at every corner. How far has it turned when it gets home?

Every number stands for a letter. Write the letter for each of your answers in the box above that number. Leave the other boxes empty. Then read the boxes you filled, left to right. **If they do not spell a word, one answer is wrong.**

11 = U 13 = F 14 = F 16 = U 36 = T 40 = L 60 = U 72 = R 108 = L 120 = T 140 = L 144 = U 900 = R 1260 = N
3240 = N 3600 = L

11	13	14	16	36	40	60	72	108	120	140	144	900	1260	3240	3600



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Scavenger Hunt — answers

For the teacher

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

P → C → E → J → Q → F → A → M → P

An ant walks once around a polygon and turns at every corner. How far has it turned when it gets home? The answer is *FULL TURN*: the exterior angles of any convex polygon add up to 360° . The ring's answers, in the order of the boxes on the record sheet (smallest number first), with their letters: **13 F · 16 U · 40 L · 108 L · 120 T · 144 U · 900 R · 3240 N**.

	Card	What the card asks	Answer, and why	Wrong answer from the common mistake	Joke letter for the number at its top
1	P	7 sides: total of the interior angles	900 . From one corner, the diagonals cut a polygon with 7 sides into 5 triangles, so the total is $5 \times 180^\circ = 900^\circ$.	1260, from 7×180 , one triangle for each side	L
2	C	regular, 9 sides: one exterior angle	40 . The exterior angles total 360° , shared by 9 equal angles: $360 \div 9 = 40^\circ$.	140, the interior angle instead of the exterior one	R
3	E	interior angles total 1980° : number of sides	13 . $1980 \div 180 = 11$ triangles, and a polygon has 2 more sides than triangles: 13 sides.	11, the number of triangles, not sides	L
4	J	regular, 10 sides: one interior angle	144 . The interior angles total $(10 - 2) \times 180^\circ = 1440^\circ$, shared by 10 equal angles: $1440 \div 10 = 144^\circ$.	36, from $360 \div 10$, which is the exterior angle	F
5	Q	20 sides: total of the interior angles	3240 . From one corner, the diagonals cut a polygon with 20 sides into 18 triangles, so the total is $18 \times 180^\circ = 3240^\circ$.	3600, from 20×180 , one triangle for each side	U
6	F	regular, 3 sides: one exterior angle	120 . The exterior angles total 360° , shared by 3 equal angles: $360 \div 3 = 120^\circ$.	60, the interior angle instead of the exterior one	N
7	A	interior angles total 2520° : number of sides	16 . $2520 \div 180 = 14$ triangles, and a polygon has 2 more sides than triangles: 16 sides.	14, the number of triangles, not sides	T
8	M	regular, 5 sides: one interior angle	108 . The interior angles total $(5 - 2) \times 180^\circ = 540^\circ$, shared by 5 equal angles: $540 \div 5 = 108^\circ$.	72, from $360 \div 5$, which is the exterior angle	U

Each wrong answer in the table is the number at the top of a card off the ring. Those cards are on the next page.

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 back to the card it got wrong. If the group makes the same mistake again, it goes to another card off the ring. So a second wrong answer never moves a group forward.

Card	What the card asks	Answer, and why	Wrong answer from the common mistake	Joke letter for the number at its top
G	regular, 5 sides: one interior angle	108. The interior angles total $(5 - 2) \times 180^\circ = 540^\circ$, shared by 5 equal angles: $540 \div 5 = 108^\circ$.	72, from $360 \div 5$, which is the exterior angle	N
L	7 sides: total of the interior angles	900. From one corner, the diagonals cut a polygon with 7 sides into 5 triangles, so the total is $5 \times 180^\circ = 900^\circ$.	1260, from 7×180 , one triangle for each side	L
K	regular, 9 sides: one exterior angle	40. The exterior angles total 360° , shared by 9 equal angles: $360 \div 9 = 40^\circ$.	140, the interior angle instead of the exterior one	U
N	interior angles total 1980° : number of sides	13. $1980 \div 180 = 11$ triangles, and a polygon has 2 more sides than triangles: 13 sides.	11, the number of triangles, not sides	T
B	regular, 10 sides: one interior angle	144. The interior angles total $(10 - 2) \times 180^\circ = 1440^\circ$, shared by 10 equal angles: $1440 \div 10 = 144^\circ$.	36, from $360 \div 10$, which is the exterior angle	L
H	20 sides: total of the interior angles	3240. From one corner, the diagonals cut a polygon with 20 sides into 18 triangles, so the total is $18 \times 180^\circ = 3240^\circ$.	3600, from 20×180 , one triangle for each side	U
R	regular, 3 sides: one exterior angle	120. The exterior angles total 360° , shared by 3 equal angles: $360 \div 3 = 120^\circ$.	60, the interior angle instead of the exterior one	F
D	interior angles total 2520° : number of sides	16. $2520 \div 180 = 14$ triangles, and a polygon has 2 more sides than triangles: 16 sides.	14, the number of triangles, not sides	R

Other mistakes lead to no card at all. A group might answer 360° for every total, or count the diagonals instead of the triangles, or give the whole total when one angle is asked. Its answer is then not the number at the top of any card, and the group knows to check its work.

Guessing does not work. Every simple rule that uses only the printed number and the look of the card, such as always working out $(n - 2) \times 180$, answers at most eight of the sixteen cards correctly.