

ORIGO

STEPPING STONES

SAMPLE PAGES

CORE MATHEMATICS



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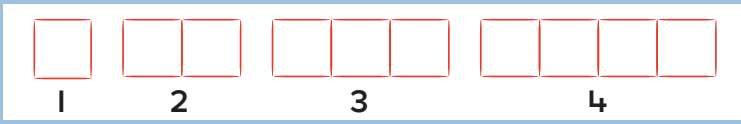
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Step In

Identifying and Describing Geometric Patterns

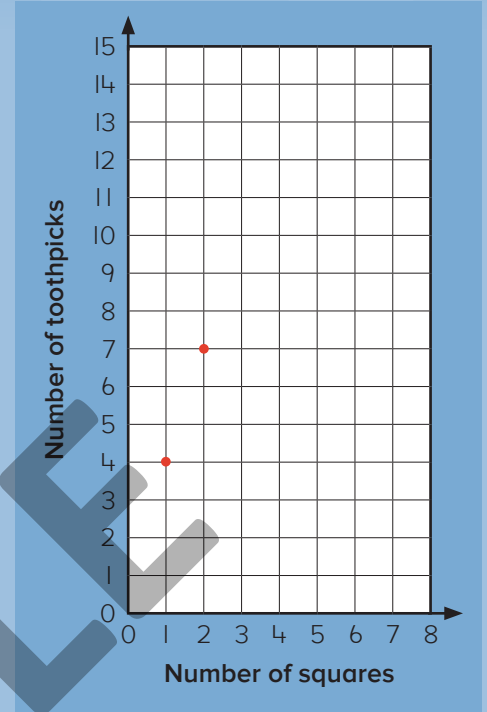
This growing pattern was made with toothpicks.



What do you notice?
What patterns do you see?

Complete this table to match the pattern.

Picture number	1	2	3	4
Number of squares	1	2		
Number of toothpicks	4	7		

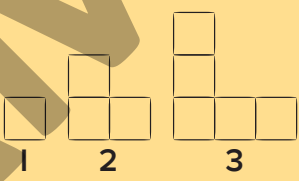


How could you work out the number of toothpicks in the 7th picture? What pattern rule could you use?

Draw more dots to continue the toothpick pattern on the graph.

Step Up

1. Look at this pattern made with toothpicks.

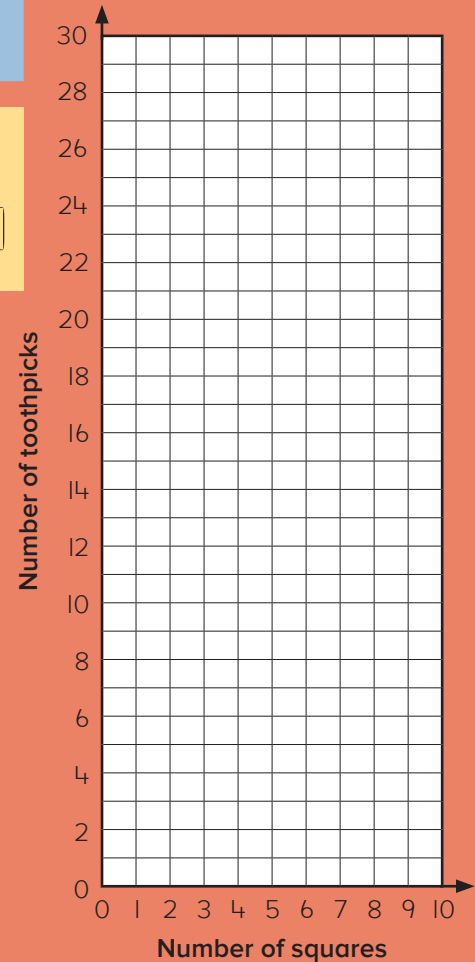


a. Complete the table. If necessary, draw more pictures on scrap paper.

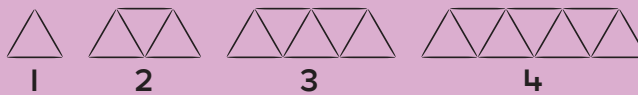
Picture number	1	2	3	4	5
Number of squares	1				
Number of toothpicks	4				

b. Describe the pattern that you see.

c. Draw dots on the graph to show the pattern.



2. Look at this pattern made with toothpicks.

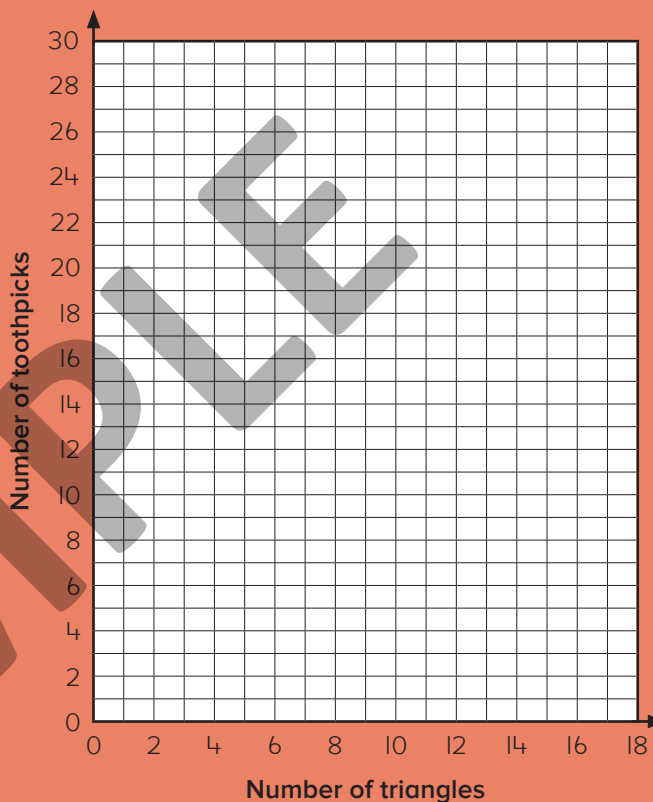


a. Complete the table. If necessary, draw more pictures on scrap paper.

Picture number	1	2	3	4	5
Number of triangles	1				
Number of toothpicks	3				

b. Describe the pattern that you see.

- c. Draw blue dots on the graph to show the pattern.
- d. Use the pattern to work out the number of toothpicks for Picture 6 and Picture 7. Then draw dots on the graph to continue the pattern.



Step Ahead

Continue the pattern. Then draw red dots to represent the pattern on the graph in Question 2 above.

Picture 1



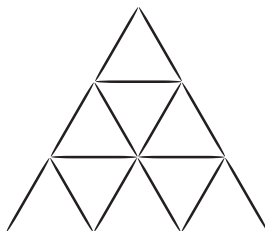
3 toothpicks

Picture 2



9 toothpicks

Picture 3



toothpicks

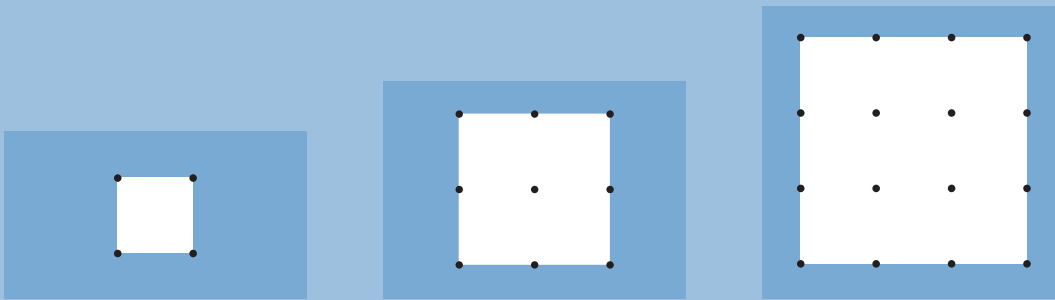
Picture 4

toothpicks

Step In

Identifying and Describing Number Patterns

What number patterns can you find in these pictures?



How do the number patterns below describe the pictures of the squares?

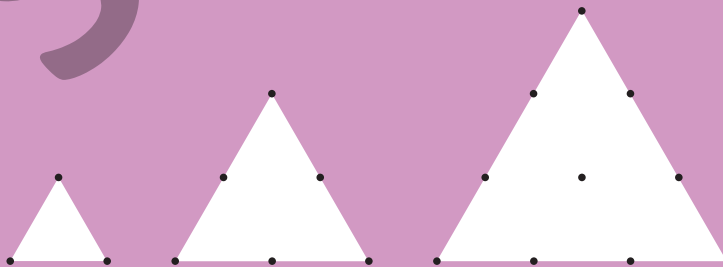
<p>Anna</p> <p>4, 8, 12, ...</p>	<p>Haroon</p> <p>1, 2, 3, ...</p>	<p>Daniel</p> <p>2, 3, 4, ...</p>	<p>Mio</p> <p>1, 4, 9, ...</p>
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What will be the next three terms in each student's pattern?

How did you decide?

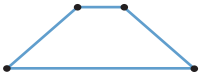
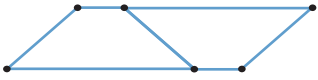
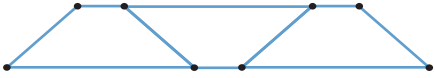
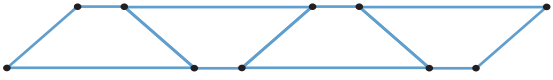
Step Up

1. Look at this pattern. Write the missing numbers in the table below.



Length of side	1	2	3	4	5	10
Dots along one side						
Dots around the triangle						

2. Complete this table to describe this pattern of quadrilaterals.

Quadrilateral frames	Number of quadrilaterals	A Number of dots	B Number of lines
			
			
			
			
<p>3. Write the number of quadrilaterals, dots and lines for the next six frames.</p>			
<p>4. Describe the pattern in these columns.</p>			
<p>A</p> <hr/> <hr/>			
<p>B</p> <hr/> <hr/>			

Step Ahead

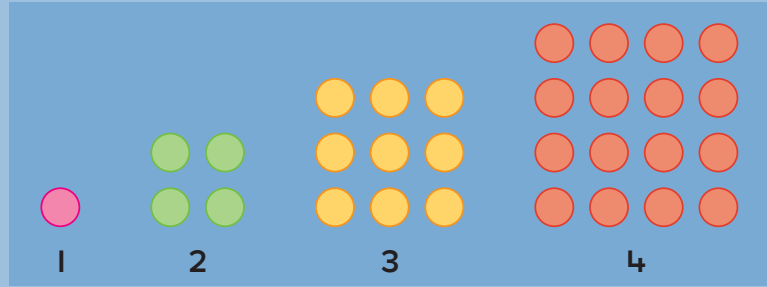
Work out the 20th term for the patterns each student found in the picture of squares at the top of page 130.

<p>a. Anna</p>	<p>b. Haroon</p>
<p>c. Daniel</p>	<p>d. Mio</p>

Step In

Identifying Relationships Between Two Numerical Patterns

Look at this growing pattern.
What types of numbers are represented?



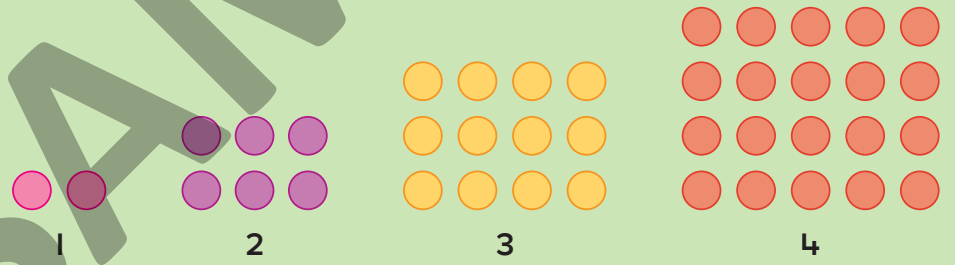
What numbers should be written in the second row of this table to describe the pattern?

Picture number	1	2	3	4	5	6	7
Total number of counters							

How did you work out the numbers to write in the table?
What do you notice about the number you wrote for each picture?

Step Up

1. Look at the pictures for these oblong numbers.

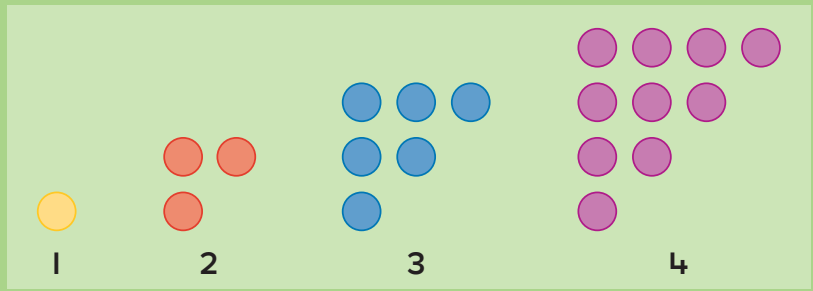


a. Complete the table below to show the total number of counters in each picture of this pattern.

Picture number	1	2	3	4	5	6	7
Total number of counters	2						

b. Write how you worked out the numbers to keep the pattern going.

2. Look at the pictures for these triangular numbers.



Complete the table below to show the total number of counters in each picture of this pattern.

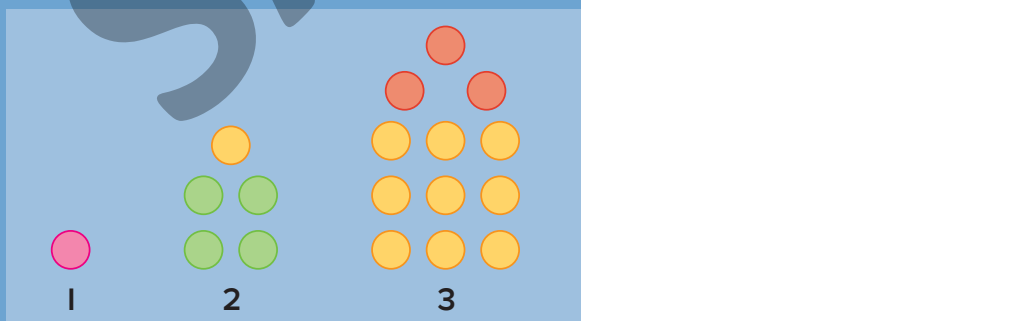
Picture number	1	2	3	4	5	6	7
Total number of counters	1						

3. Look at the number of counters for each term in Questions 1a and 2. Write how the patterns are related.

Step Ahead

This pattern of 'houses with roofs' was made by joining the shape in the pattern above and the shape in the pattern at the top of page 132. The first row of the table matches the number of rows of counters in the square part of the 'house'.

- a. Draw the next picture in the pattern.



- b. Complete the table below to show the total number of counters in the pictures of this pattern.

Picture number	1	2	3	4	5	6	7
Total number of counters	1						

Step In

Creating Number Patterns Involving Decimal Fractions and Common Fractions

How much does this jar weigh?

How would the total mass change if there were 2, 3 or 4 jars on the scale?



The mass will increase by 0.4 kg each term. That's 0.4 kg, 0.8 kg, 1.2 kg...



Imagine several jars are placed on the scale and the total mass is now 2.8 kg.

How many jars were placed on the scales? How do you know?

Complete this table.

Jars	1	2	3	5	7	10
Mass (kg)	0.4	0.8				

How could you show the same pattern with common fractions?

Step Up

I. a. The picture shows the mass of one jar. Complete the table.

Number of jars	1	2	3	5	7	10
Total mass (kg)	0.3					



b. Write how you worked out the numbers to keep the pattern going.

2. a. Complete the table.

Number of jars	1	2	3	4	8	10
Total mass (kg)	0.25					

b. Write the rule you used to work out the masses.

3. This table shows some terms in a different pattern.

Number of jars	1	2	3	6	10	12
Total mass (kg)	$\frac{6}{10}$					

a. Write the rule you would use to continue the pattern. Then complete the table.

b. Use your rule to work out the total mass in these numbers of jars.

20 jars kg 50 jars kg 80 jars kg

Step Ahead

Zookeepers are monitoring the weight gain of four tiger cubs. They are concerned about the weight gain of one cub. Look for patterns in the table to identify the tiger cub they are concerned about. Explain your thinking.

Weight (kg)					
Tiger cub	Week 1	Week 2	Week 3	Week 4	Week 5
Cia	3.6	4.1	4.6	5.1	5.5
Samba	3.5	3.7	3.8	4	4.1
Chilli	3.2	3.7	4.1	4.6	5
Simba	4.1	4.5	5	5.4	5.9

Step In

Using Mental Strategies to Multiply Two-Digit Numbers

What does it cost to make an international phone call?



It depends on the country you call, the time that you make the call and how long you talk.



Canada 25c



France 32c



Germany 28c



Ireland 45c



Italy 30c

How could you work out the cost of a four-minute call to Ireland?

Grace used place value to work it out.

$$4 \times 40 + 4 \times 5$$

Layla used the double double strategy.

Double 45 then double 90

Luke used a doubling-and-halving strategy.

$$4 \times 45 \text{ is the same as } 2 \times 90$$

Jianna used factors like this.

$$4 \times 45 \text{ is the same as } 4 \times 5 \times 9$$

How did you convert your answer to dollars and cents?

How much would it cost for a four-minute call to each of the other countries?

What strategies could you use to work it out?

How could you work out the cost of a 15-minute call to France?

Step Up

Use the data in this table to complete Question 1 below and Questions 2, 3 and 4 on page 137.

Home Phone International Call Costs per Minute from Australia

Greece	Iran	Denmark	Egypt	Fiji	Jordan	Kenya	India
45c	55c	40c	50c	70c	75c	45c	70c

1. Work out the cost of making these calls from Australia.

a. Jordan for 3 minutes

\$ _____

b. India for 6 minutes

\$ _____

c. Fiji for 4 minutes

\$ _____

d. Iran for 8 minutes

\$ _____

Refer to the data table at the bottom of page 136 to answer these questions.

2. Work out these call costs.

<p>a. Kenya for 4 minutes</p> <p>\$ _____</p>	<p>b. Egypt for 7 minutes</p> <p>\$ _____</p>	<p>c. Greece for 9 minutes</p> <p>\$ _____</p>	<p>d. Denmark for 6 minutes</p> <p>\$ _____</p>
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3. Work out the cost of a 15-minute call from Australia to these countries.

<p>a. Kenya</p> <p>\$ _____</p>	<p>b. Denmark</p> <p>\$ _____</p>	<p>c. Iran</p> <p>\$ _____</p>
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4. Work out the cost of a 12-minute call from Australia to these countries.

<p>a. India</p> <p>\$ _____</p>	<p>b. Greece</p> <p>\$ _____</p>	<p>c. Egypt</p> <p>\$ _____</p>
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Step Ahead

Sometimes phone calls cost more at certain times of the day. These times are called peak times. Work out how much you would **save** if you made a 15-minute **off-peak** call to these countries.

Home Phone International Call Costs per Minute from Australia						
To	Greece	Iran	Denmark	Egypt	Fiji	India
Off-Peak	39c	48c	39c	49c	69c	67c
Peak	45c	55c	40c	50c	70c	70c

a. Greece	<input type="text"/>	b. Iran	<input type="text"/>	c. Denmark	<input type="text"/>
d. Egypt	<input type="text"/>	e. Fiji	<input type="text"/>	f. India	<input type="text"/>

Step In

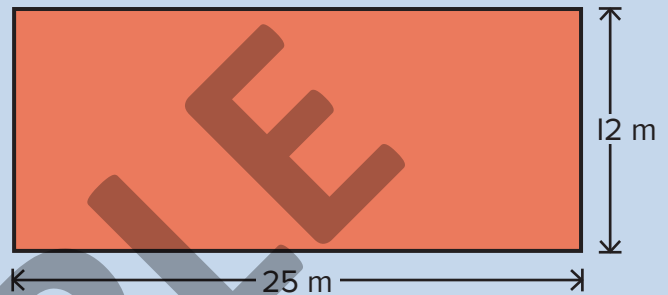
Comparing Mental Strategies for Multiplication

Think about some of the different situations in which you use multiplication.



Multiplication is used to work out the cost of accommodation, car hire or telephone calls.

Imagine you have to buy carpet for this floor area. Look at how these students work out the area that has to be covered.



Mariam used place value and multiplied the tens and then the ones.

$$10 \times 25 + 2 \times 25$$

Soma used a doubling-and-halving strategy.

$$12 \times 25 \text{ is the same as } 6 \times 50$$

Liam used factors.

$$12 \times 25 \text{ is the same as } 3 \times 4 \times 25$$

Is there another way you could work it out? Which method do you like best? Why?

Use a strategy you like to calculate the area of a rectangle measuring 15 cm \times 24 cm.

Step Up

Read about these strategies used to mentally calculate 36×50 .



I multiplied 36 by 10. Then I multiplied my answer by 5 because 50 is 5×10 .

I multiplied 36 by 100. Then I halved my answer because 50 is one-half of 100.



1. Try to use more than one method from page 138 to solve these.

a. $16 \times 50 =$

b. $24 \times 50 =$

c. $25 \times 50 =$

d. $27 \times 50 =$

e. $15 \times 50 =$

f. $14 \times 50 =$

2. Use a method you like to mentally calculate these.

a. $72 \times 50 =$

b. $34 \times 50 =$

c. $64 \times 50 =$

d. $42 \times 50 =$

e. $28 \times 50 =$

f. $31 \times 50 =$

3. Write how you would mentally work out 32×25 .

4. Use the same method to mentally calculate these.

a. $24 \times 25 =$

b. $16 \times 25 =$

c. $28 \times 25 =$

d. $44 \times 25 =$

e. $12 \times 25 =$

f. $36 \times 25 =$

5. Complete number sentences you can solve using your method.

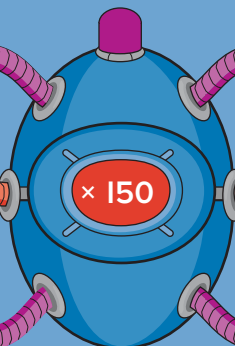
a. $\times 50 =$

b. $50 \times$ $=$

Step Ahead

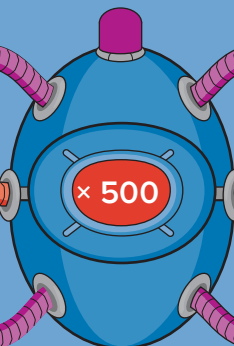
Write the missing numbers in each machine.

a. IN



OUT

b. IN



OUT

Step In

Using a Double-and-Halve Strategy to Multiply Dollars and Cents

How could you work out the cost of buying two issues of this comic book?

How could you work out the cost of buying 12 issues?



I double doubled \$1.25 to work out the cost of 4 issues. That's \$5 and 3 x \$5 is \$15.



Three issues cost \$3.75. The cost of 12 issues is double double \$3.75. That's \$15.

Eva used a double-and-halve strategy. Write how you think she multiplied.

Use Eva's strategy to calculate this product.

$$12 \times \$1.50 = \$ \underline{\hspace{2cm}}$$

is the same as

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

Step Up

- I. **Double** one number and **halve** the other to make a problem that is easier to solve. If necessary, repeat this step then write the product.

a. $6 \times \$1.15 = \$ \underline{\hspace{2cm}}$

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$$

b. $6 \times \$2.50 = \$ \underline{\hspace{2cm}}$

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$$

c. $6 \times \$1.25 = \$ \underline{\hspace{2cm}}$

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$$

2. Double and halve to solve these.

<p>a.</p> $6 \times \$0.75 = \$$ <input type="text"/> <p><input type="text"/> \times <input type="text"/></p> <p><input type="text"/> \times <input type="text"/></p>	<p>b.</p> $\$1.25 \times 16 = \$$ <input type="text"/> <p><input type="text"/> \times <input type="text"/></p> <p><input type="text"/> \times <input type="text"/></p>	<p>c.</p> $24 \times \$0.75 = \$$ <input type="text"/> <p><input type="text"/> \times <input type="text"/></p> <p><input type="text"/> \times <input type="text"/></p>
<p>d.</p> $\$0.25 \times 16 = \$$ <input type="text"/> <p><input type="text"/> \times <input type="text"/></p> <p><input type="text"/> \times <input type="text"/></p>	<p>e.</p> $32 \times \$1.50 = \$$ <input type="text"/> <p><input type="text"/> \times <input type="text"/></p> <p><input type="text"/> \times <input type="text"/></p>	<p>f.</p> $8 \times \$1.75 = \$$ <input type="text"/> <p><input type="text"/> \times <input type="text"/></p> <p><input type="text"/> \times <input type="text"/></p>

3. Use the same strategy to work out these.

a. $4 \times \$1.45 = \$$ <input type="text"/>	b. $8 \times \$1.25 = \$$ <input type="text"/>	c. $8 \times \$2.50 = \$$ <input type="text"/>
d. $16 \times \$0.50 = \$$ <input type="text"/>	e. $16 \times \$0.75 = \$$ <input type="text"/>	f. $24 \times \$0.25 = \$$ <input type="text"/>

4. Write some number sentences involving money that you can solve by doubling and halving.

a. <input type="text"/> \times <input type="text"/> = <input type="text"/>	b. <input type="text"/> \times <input type="text"/> = <input type="text"/>
c. <input type="text"/> \times <input type="text"/> = <input type="text"/>	d. <input type="text"/> \times <input type="text"/> = <input type="text"/>

Step Ahead

Moran has \$20 to spend on comic books. If he buys some of each type, work out a possible combination of issues he could buy with the least amount of change. You can use a calculator to help.



ACTION COMICS

\$1.75

issues

DETECTIVE MYSTERY

\$1.45

issues

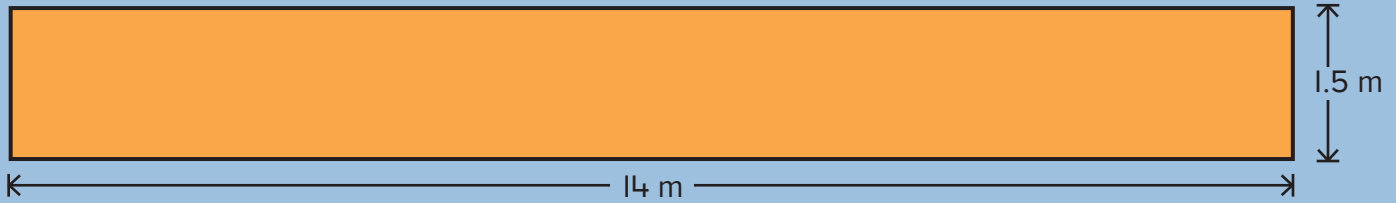
DINO STORIES

\$2.25

issues

Step In → Using Multiplication Strategies with Decimal Fractions

This large rectangle represents an area that has to be paved.



How could you work out the number of square metres that will be covered?

I split 1.5 into two parts. 14×1.5 is the same as $14 \times 1 + 14 \times 0.5$.



Aiden used the formal algorithm. He followed these steps.

Are the steps easy to follow?

Step 1	Step 2	Step 3
Multiply the tenths.	Multiply the ones.	Add the partial products.
$\begin{array}{r} 2 \\ 14 \\ \times 1.5 \\ \hline 7.0 \end{array}$	$\begin{array}{r} 2 \\ 14 \\ \times 1.5 \\ \hline 7.0 \\ 14.0 \end{array}$	$\begin{array}{r} 2 \\ 14 \\ \times 1.5 \\ \hline 7.0 \\ 14.0 \\ \hline 21.0 \end{array}$

How are these steps similar to other algorithms you have used?

Step Up →

1. Split the decimal fraction to complete these number sentences.

I know 0.5 is one-half, 0.25 is one-quarter and 0.75 is three-quarters.

- a. 24×1.25 is the same as $24 \times \underline{\quad}$ + $24 \times \underline{\quad}$ = $\underline{\quad}$
- b. 8×3.25 is the same as $8 \times \underline{\quad}$ + $8 \times \underline{\quad}$ = $\underline{\quad}$
- c. 12×1.5 is the same as $12 \times \underline{\quad}$ + $12 \times \underline{\quad}$ = $\underline{\quad}$
- d. 14×2.5 is the same as $14 \times \underline{\quad}$ + $14 \times \underline{\quad}$ = $\underline{\quad}$
- e. 16×2.75 is the same as $16 \times \underline{\quad}$ + $16 \times \underline{\quad}$ = $\underline{\quad}$



2. Use the thinking from Question 1 to calculate each product.

a. $28 \times 1.25 =$

b. $12 \times 2.25 =$

c. $20 \times 1.75 =$

d. $22 \times 1.5 =$

e. $18 \times 3.5 =$

f. $24 \times 2.75 =$

3. Use the formal multiplication algorithm to calculate these.

a. 32×1.8

b. 12×2.9

c. 14×1.7

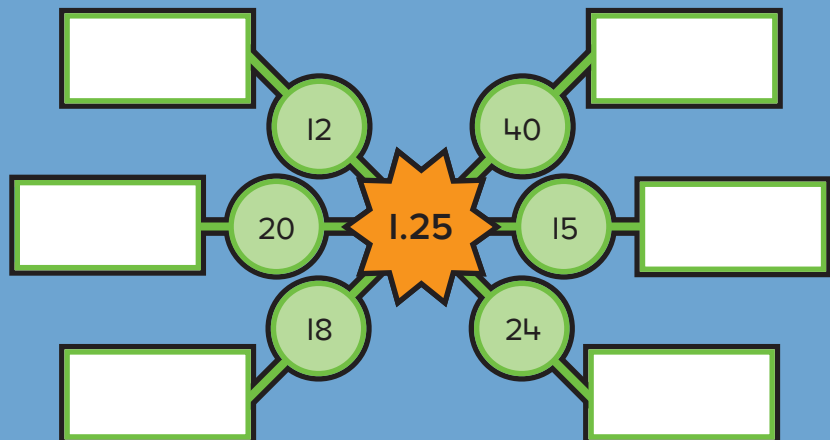
d. 25×2.3

e. 15×2.6

f. 18×1.9

Step Ahead

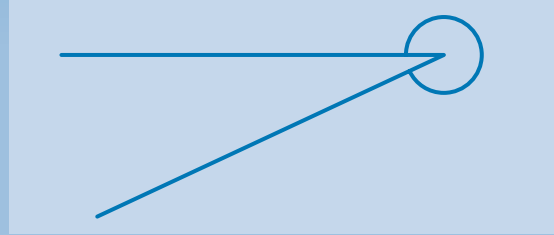
Multiply the numbers in the circles by the number in the middle. Write your answers around the outside.



Step In → Estimating and Measuring Angles

How could you measure this angle?

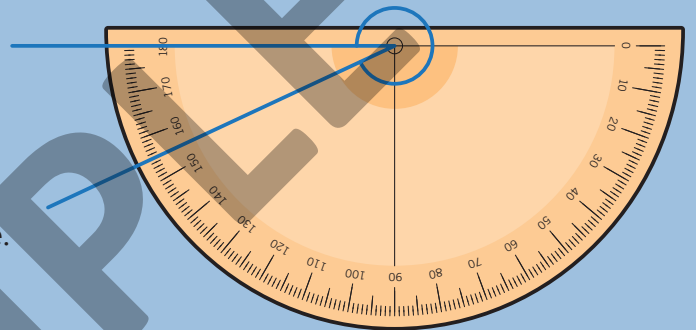
I would start by estimating. I know it is greater than a three-quarter turn, so it must be between 270 and 360 degrees.



Measuring angles with a 360° protractor is easy. I'm not sure about how to use a 180° protractor though.

Addison and Jamal know that a straight angle is 180° because it is half of a full turn. Knowing that part, they turned the protractor upside down to measure the rest of the angle.

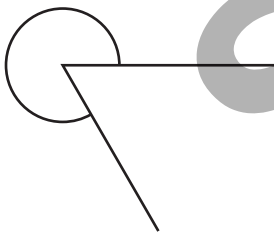
Jamal then used addition to calculate the total angle. Addison used subtraction. They both worked out the correct answer. What steps do you think they followed?



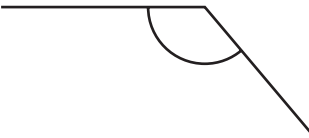
Step Up →

1. Write **acute**, **obtuse** or **reflex** to describe each angle below.

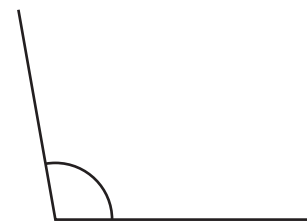
a.



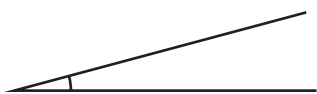
b.



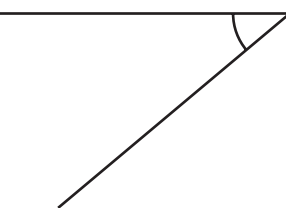
c.



d.



e.



f.



2. Estimate and write the size of each angle in Question 1. Use the picture below to help. Do **not** use a protractor.



a. _____ °	b. _____ °	c. _____ °	d. _____ °	e. _____ °	f. _____ °
------------	------------	------------	------------	------------	------------

3. Use a protractor to measure the angles in Question 1. Write your answers below.

a. _____ °	b. _____ °	c. _____ °	d. _____ °	e. _____ °	f. _____ °
------------	------------	------------	------------	------------	------------

4. Use a protractor and ruler to draw each shape.

a. a triangle with two angles that are 40°	b. a quadrilateral with two angles that are 65°

Step Ahead

Karin turned on the spot two times. She turned a total of 720° ($2 \times 360 = 720$). Complete these. You can use a calculator to help.



a. $1\frac{1}{2}$ turns is the same as _____ °	b. $2\frac{1}{4}$ turns is the same as _____ °	c. $3\frac{2}{3}$ turns is the same as _____ °
d. 900° is the same as _____ turns	e. 1350° is the same as _____ turns	f. 480° is the same as _____ turns

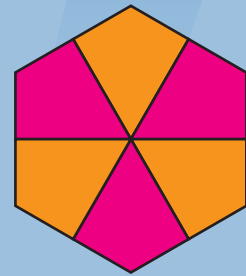
Step In

Examining Angles Around a Point

What do you know about the shapes in this design?

What do you know about the angles of the shapes?

What do you notice about the angles at the centre of the design?



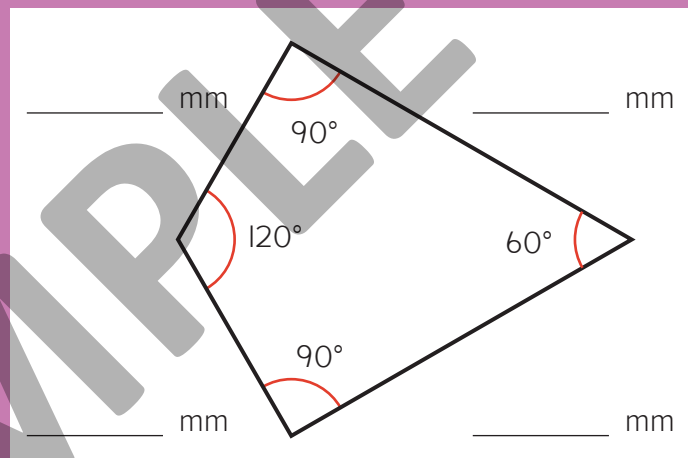
Step Up

- I. a. The design above used shapes like the one below. Complete the chart to show four more ways of combining the angles around a point to total 360° .

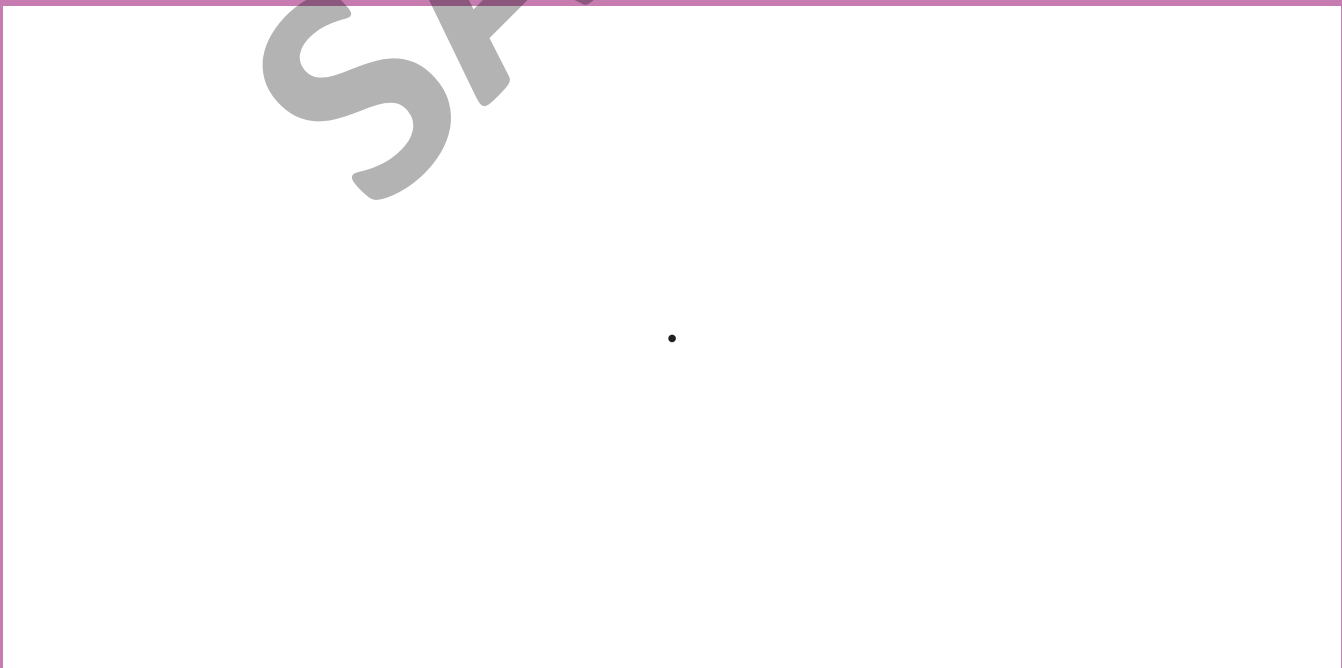
Combinations of angles
that total 360°

$$60 + 60 + 60 + 60 + 60 + 60$$

- b. Measure and write the length of each side of the kite below.



2. Choose one of your combinations from the chart in Question I. Draw identical kites to show how they fit around the point below. Use a ruler and protractor to help you.



3. Use what you know about the angles around a point to work out the unknown angles in each picture below. You can use a calculator but do **not** use a protractor.

Angle **a** = _____ °

Angle **b** = _____ °

Angle **c** = _____ °

Angle **d** = _____ °

Angle **e** = _____ °

Angle **f** = _____ °

Step Ahead

a. Calculate two combinations of kite angles from Question 1 that could be arranged to form a straight angle.

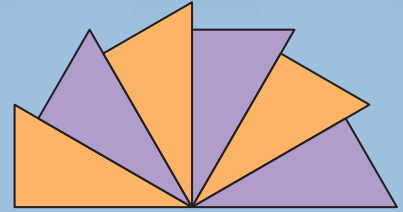
b. Draw a combination of kites to show your thinking.

Step In Exploring Angles in Right Angles and on Straight Lines

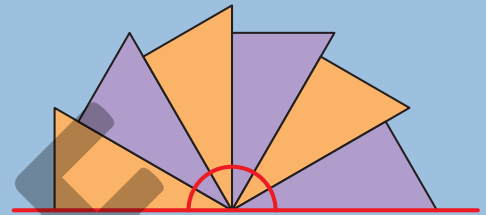
What do you know about the shapes in this picture?

What do you know about the angles of the shapes?

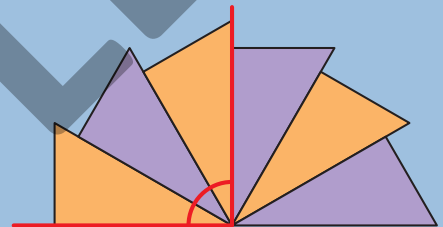
What do you notice about the angles that meet at the bottom of the picture?



I can see that all the angles that meet at the bottom make a straight line. The total must be 180° .



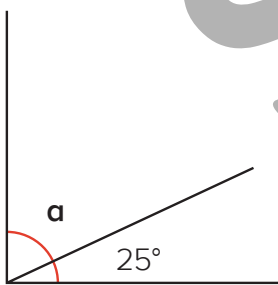
If six of those angles makes 180° then three of them must have a total that is half of that. That means together they make a right angle.



How could you work out the size of each angle at the bottom of the design?

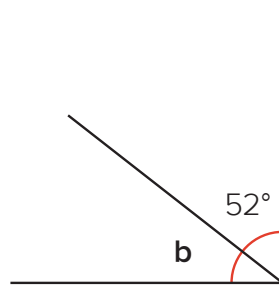
Step Up

1. Use what you know about right angles to work out the unknown angles in each picture below. You can use a calculator but do **not** use a protractor.



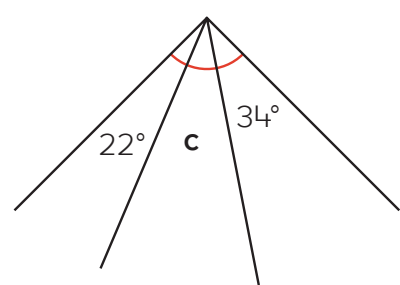
Angle sum = 90°

Angle **a** = _____



Angle sum = 90°

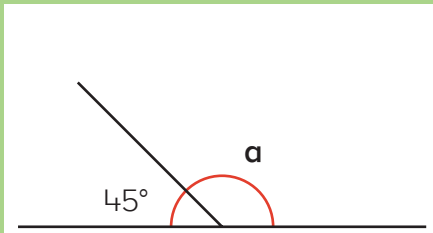
Angle **b** = _____



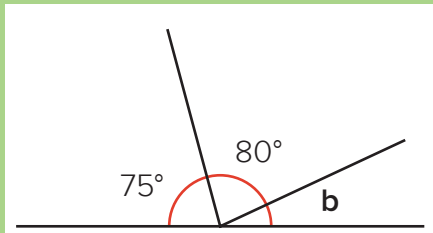
Angle sum = 90°

Angle **c** = _____

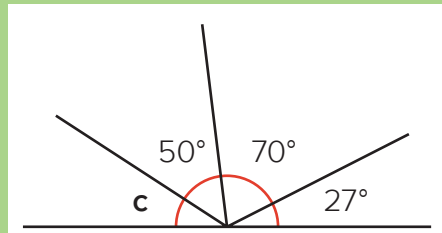
2. Use what you know about angles on a straight line to work out the unknown angles in each picture below. You can use a calculator but do **not** use a protractor.



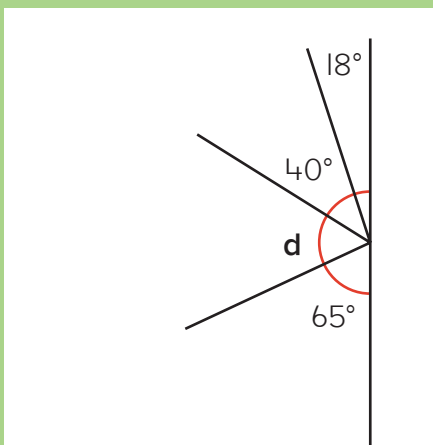
Angle **a** = _____ °



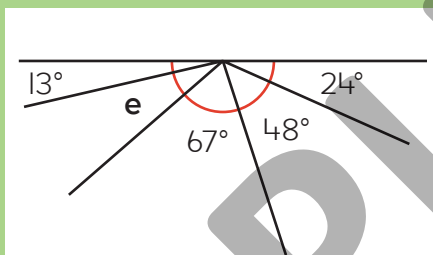
Angle **b** = _____ °



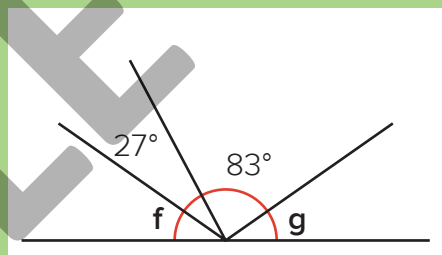
Angle **c** = _____ °



Angle **d** = _____ °



Angle **e** = _____ °



Angles **f** and **g** are equal.

Angle **f** = _____ °

Step Ahead

Solve each problem. Show your thinking.

a. Angles **f** and **g** form a straight line. Angle **g** is 134° . What is the difference in size between Angle **f** and Angle **g**?

_____ °

b. Angles **q**, **r** and **s** form a straight line. Angle **r** is a right angle. Angle **s** is $\frac{1}{3}$ of Angle **r**. What size is Angle **q**?

_____ °

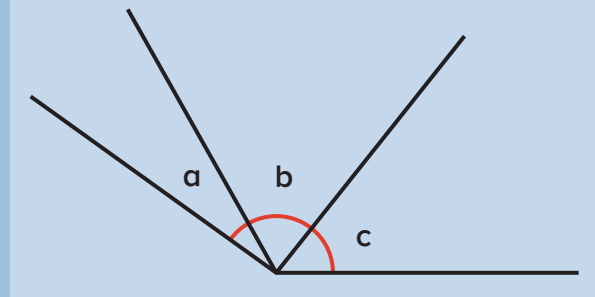
Step In Investigating Vertically Opposite Angles

Adjacent angles share an angle arm and a vertex.

Angle **a** and Angle **b** are adjacent angles.

Which angle arm do they have in common?

Angle **a** and Angle **c** are not adjacent even though they share a vertex.

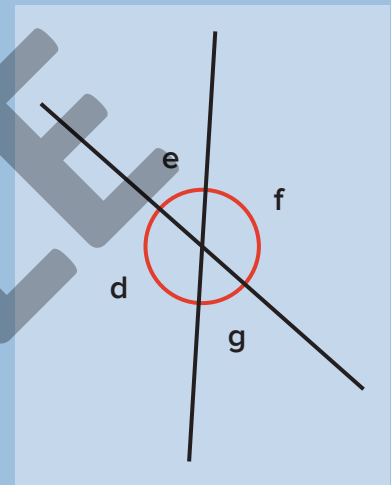


When two lines intersect four angle arms are made.

Angle **d** and Angle **f** are vertically opposite angles.

Which other angles are vertically opposite?

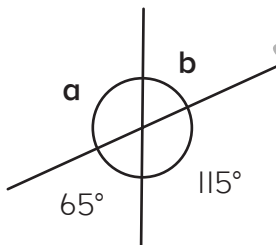
Which angles are adjacent?



Vertically opposite angles do not have to be vertical. The word **vertical** comes from **vertex** and vertically opposite angles are on opposite sides of a vertex.

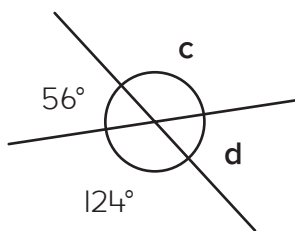
Step Up

1. Each picture below is made by intersecting straight lines. Use what you know about vertically opposite angles to work out the unknown angles. Do **not** use a protractor.



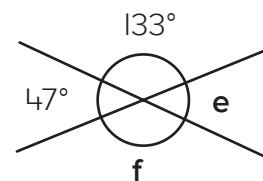
Angle **a** = °

Angle **b** = °



Angle **c** = °

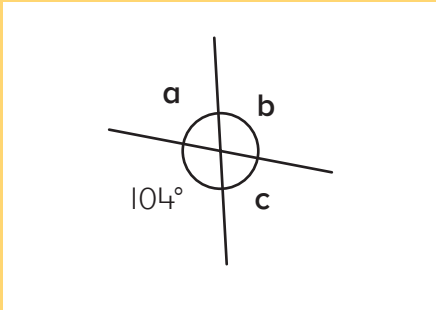
Angle **d** = °



Angle **e** = °

Angle **f** = °

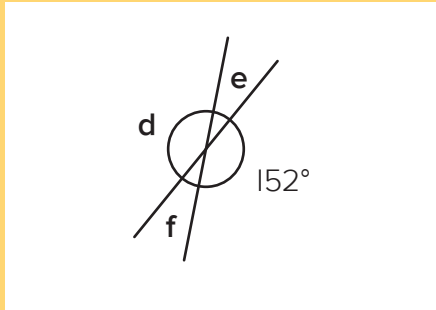
2. Use what you know about angles around a point and on a straight line to work out the unknown angles in each picture below. You can use a calculator but do not use a protractor.



Angle **a** = °

Angle **b** = °

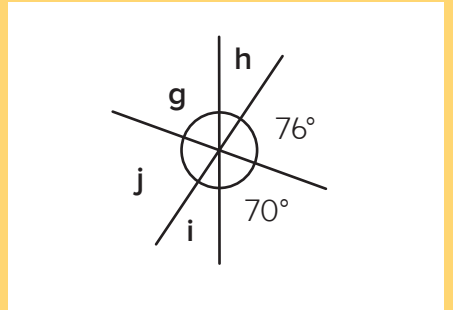
Angle **c** = °



Angle **d** = °

Angle **e** = °

Angle **f** = °

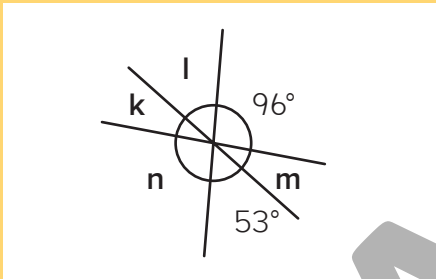


Angle **g** = °

Angle **h** = °

Angle **i** = °

Angle **j** = °



Angle **k** = °

Angle **l** = °

Angle **m** = °

Angle **n** = °

Step Ahead

Four angles are around a point. Angles **c** and **d** are adjacent angles. Angles **a** and **b** are adjacent angles. Angle **a** is 71° and Angle **d** is 119° . Are there any vertically opposite angles? Explain how you know.
