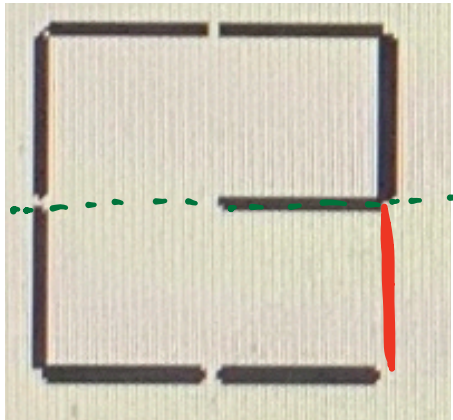
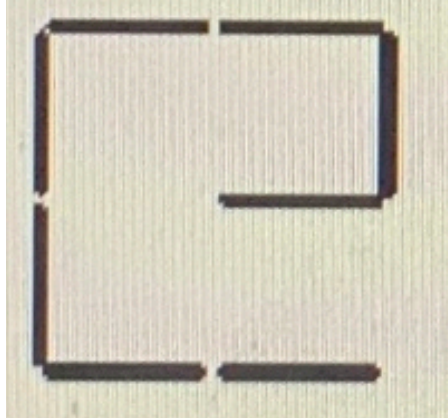


What is $1000 - 100 + 10 - 1$?

$$1000 - 100 + 10 - 1 = 900 + 9 = 909$$

The diagram shows a pattern made from matchsticks stuck to a piece of card. What is the smallest number of matchsticks that need to be added so that the resulting pattern has a line of symmetry?



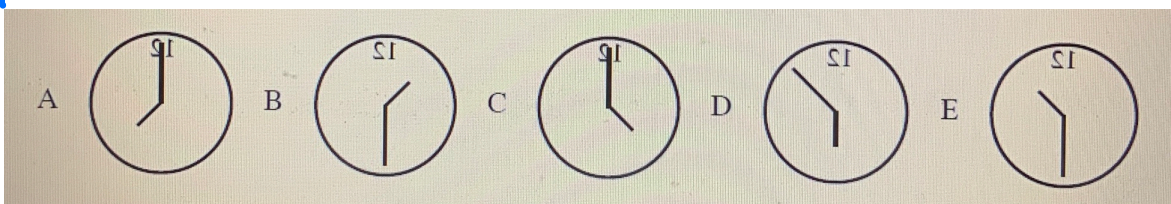
Add the red matchstick, creating the green line of symmetry.

So the answer is 1

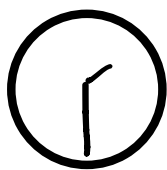
Gollum eats fish on alternate days. How often does he eat Fish on a Monday?

Once a fortnight - over a period of 14 days he will eat Fish on either the First or second Monday but not both.

If you looked in a mirror at a clock showing 1.30pm, which of the following would you see?



Normal view



So in the reversed view, the long hand is pointing down and the short hand up and to the left.

So the answer is **E**

Which of the following numbers is not the difference between two of the others?

A) 1 B) 7 C) 6 D) 5 E) 2

We have

$$1 = 7 - 6$$

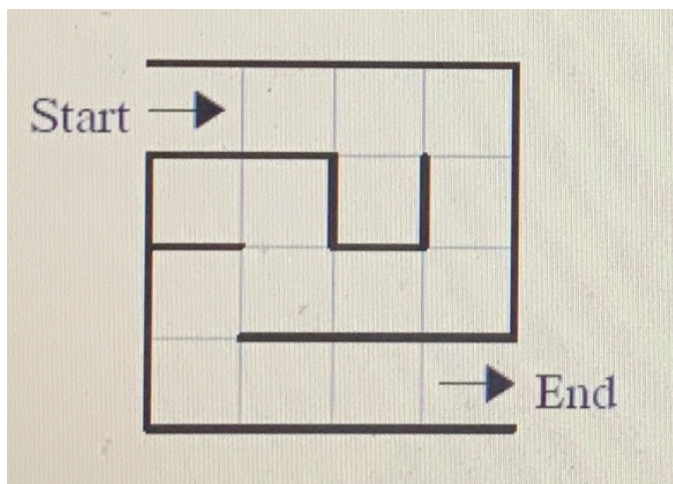
$$6 = 7 - 1$$

$$5 = 7 - 2$$

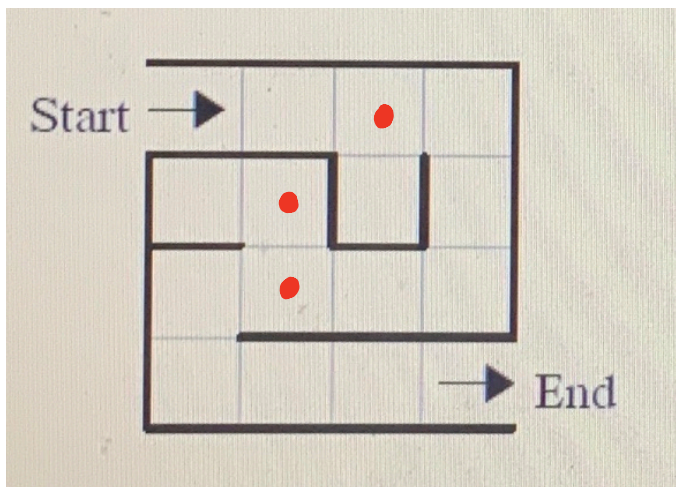
$$2 = 7 - 5$$

So the answer is **7**

Jonny's rat is a slow learner. Every time it goes through the maze, it visits every square at least once. What is the smallest possible number of squares it visits more than once?



It needs to visit the squares with the red dots more than once so it can reach the dead ends.



So the answer is 3

The lightest seeds in the world are probably those of the Creeping Lady's-tresses Orchid, 500 000 of which would weigh 1 gram. How many millions of these seeds weigh 1 kilogram?

$$\begin{aligned}
 1 \text{ kg} &= 1000 \text{ g} \\
 &= 1000 \times 500 \text{ 000 seeds} \\
 &= 1 \times 10^3 \times 5 \times 10^5 \text{ seeds} \\
 &= 5 \times 10^8 \text{ seeds} \\
 &= 500 \times 10^6 \text{ seeds}
 \end{aligned}$$

So the answer is 500 million

Peg has six times as much chocolate as Reg. Meg has twice as much chocolate as Reg. Peg has how many times as much chocolate as Meg?

Suppose Reg has n chocolates. Then Peg has $6n$ and Meg has $2n$. So Peg has

$$\frac{6n}{2n} = 3$$

times as much chocolate as Meg

Beatrix takes a sheet of paper, folds it in half 4 times and punches a hole all the way through the folded sheet. She then unfolds the sheet. How many holes are there in the unfolded sheet?

<u># folds</u>	<u>Thickness</u>
0	1 sheet
1	2 sheets
2	4 sheets
3	8 sheets
4	16 sheets

So there will be **16** holes

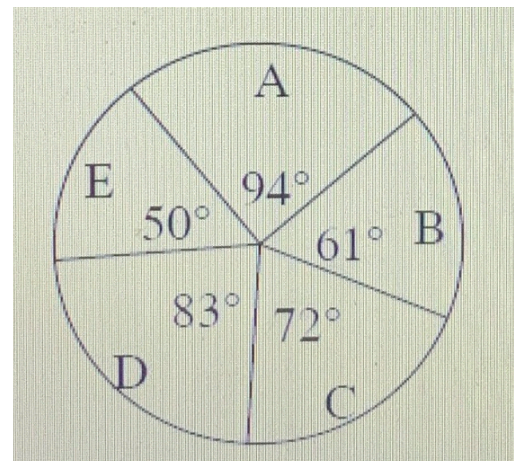
On Monday last week, Dilly started to learn the Tlingit language. Every day she learnt 5 new words but when she woke every morning she had forgotten two of the words learnt the day before. When did Dilly first achieve her target of learning 14 words?

<u>Day</u>	<u># Words</u>
M	5
Tu	$5 - 2 + 5 = 8$
W	$8 - 2 + 5 = 11$
Th	$11 - 2 + 5 = 14$

So the answer is **Thursday**

Which one of the sectors in the pie chart represents the mode?

The mode is the outcome that



occurs the most frequently - the largest sector -
So the answer is **A**

Which one of these calculations is incorrect?

A) $4 \times 5 + 67 = 45 + 6 \times 7$

B) $3 \times 7 + 48 = 37 + 4 \times 8$

C) $6 \times 3 + 85 = 63 + 8 \times 5$

D) $2 \times 5 + 69 = 25 + 6 \times 9$

E) $9 \times 6 + 73 = 96 + 7 \times 3$

A: LHS = $20 + 67 = 87$
RHS = $45 + 42 = 87$ ✓

B: LHS = $21 + 48 = 69$
RHS = $37 + 32 = 69$ ✓

C: LHS = $18 + 85 = 103$
RHS = $63 + 40 = 103$ ✓

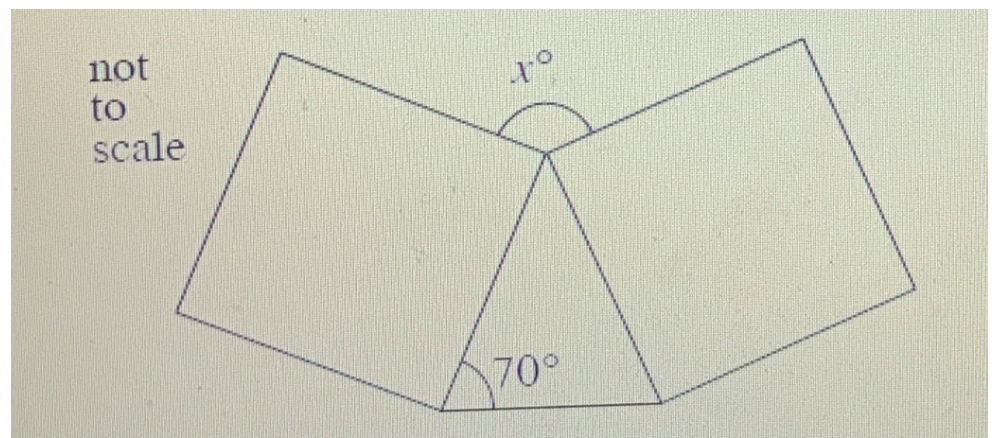
D: LHS = $10 + 69 = 79$
RHS = $25 + 54 = 79$ ✓

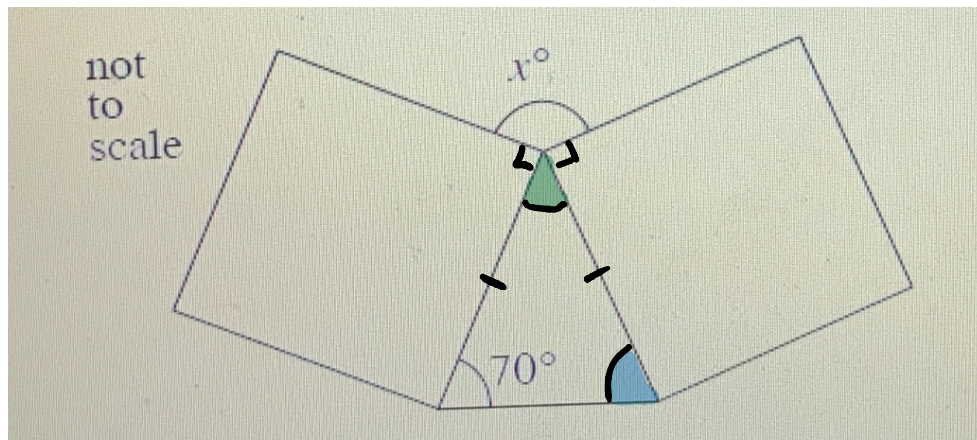
E: LHS = $54 + 73 = 127$
RHS = $96 + 21 = 117$

So the answer is **E**

The diagram shows
two equal squares.

Find x





Since the squares have the same side length, the triangle is isosceles. Hence the blue angle is 70° and the green angle is $180 - 2 \times 70 = 40^\circ$

The angles in a square are all right angles.

So

$$x = 360 - 2 \times 90 - 40 = 140^\circ$$

If the following Fractions are arranged in increasing order of size, which one is in the middle?

A) $\frac{1}{2}$ B) $\frac{2}{3}$ C) $\frac{3}{5}$ D) $\frac{4}{7}$ E) $\frac{5}{9}$

We have

$$\frac{2}{3} > \frac{1}{2}$$

$$\frac{3}{5} = 0.6 < \frac{2}{3} \approx 0.67\ldots$$

$$\frac{3}{5} > \frac{1}{2}$$

$$\frac{4}{7} - \frac{2}{3} = \frac{12 - 14}{21} < 0 \quad \text{so} \quad \frac{2}{3} > \frac{4}{7}$$

$$\frac{4}{7} - \frac{3}{5} = \frac{20 - 21}{35} < 0 \quad \text{so} \quad \frac{3}{5} > \frac{4}{7}$$

$$\frac{4}{7} > \frac{1}{2}$$

$$\frac{5}{9} - \frac{4}{7} = \frac{35 - 36}{63} < 0 \quad \text{so} \quad \frac{4}{7} > \frac{5}{9}$$

$$\frac{5}{9} > \frac{1}{2}$$

So

$$\frac{1}{2} < \frac{5}{9} < \frac{4}{7} < \frac{3}{5} < \frac{2}{3}$$

There are six different 3-digit numbers, each of which contains all the digits 1, 3 and 5. How many of these 3-digit numbers are prime?

We have $1+3+5 = 9$ so 0 of the numbers are prime because the sum of their digits is a multiple of 9 (and hence the numbers themselves are multiples of 9)

Saturn chocolate bars are packed either in boxes of 5 or boxes of 12. What is the smallest number of full boxes required to pack exactly 2005 Saturn bars?

We are looking for the largest multiple of 12 below 2005 which ends in a 0 or 5.

We have

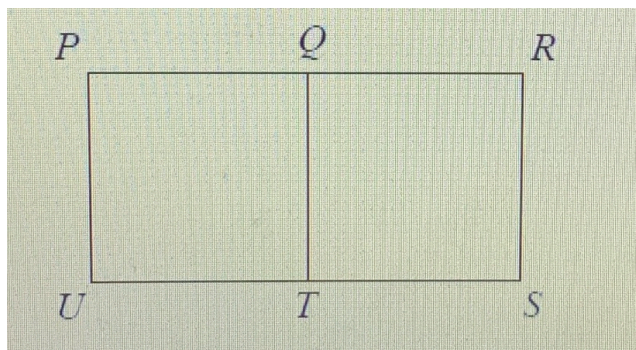
$$167 \times 12 = 2004$$

$$166 \times 12 = 1992$$

$$165 \times 12 = 1980$$

So $2005 = 165 \times 12 + 5 \times 5$ and therefore the total number of boxes required is $165 + 5 = 170$

The figure shows rectangle PRSU and line QT which divides the rectangle into two squares. How many right-angled triangles can be drawn using any three of the points P, Q, R, S, T, U as corners?



<u>Right angle</u>	<u>Triangles</u>	<u>Number</u>
P	UPQ, UPR	2
Q	UQS, PQT, RQT	3
R	SRQ, SRP	2
U	PUT, PUS	2
T	PTR, UTQ, STQ	3
S	USR, TSR	2

So the total number of triangles is **14**

In the sum shown, a, b, c are digits and $a < b$.
What is c ?

$$\begin{array}{r} b\ a \\ a\ b \\ \hline c\ 6 \end{array}$$

Since $a < b$, we need to carry to the units column.
So

$$6 = a + 10 - b$$

$$c = (b - 1) - a$$

$$\Rightarrow b = a + 4$$

$$\begin{aligned} c &= (a + 4) - 1 - a \\ &= \mathbf{3} \end{aligned}$$

Alternative: We can write the subtraction as

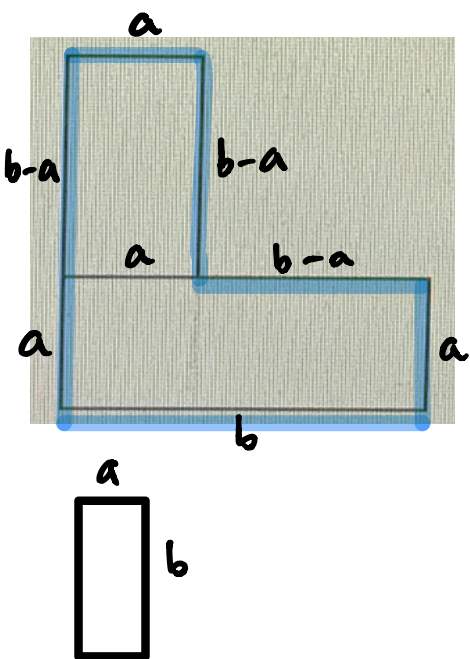
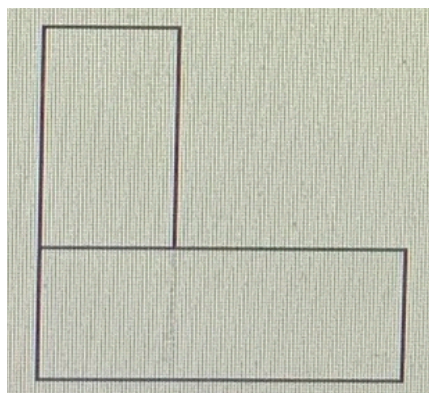
$$10b + a - (10a + b) = 9b - 9a = 9(b - a)$$

So a 2-digit multiple of 9 has units digit 6,

therefore it must be 36. So $c = 3$

Two identical rectangular cards are glued together as shown to form an 'L'-shape. The perimeter of this L-shape is 40cm. What is the ratio of the lengths of the sides of one of the original cards?

A) 1:2 B) 1:4 C) 1:5 D) 2:5 E) more info needed



Suppose the original card has width a and height b . The perimeter of the L-shape is shown on the left.

So the perimeter is

$$4a + 4(b-a) = 4a + 4b - 4a = 4b$$

Hence

$$4b = 40 \Rightarrow b = 10$$

but we don't have enough information to find the ratio of the sides.

So the answer is **E**

How many of the statements in the box are true?

None of these statements is true
Exactly 1 of these statements is true
Exactly 2 of these statements are true
All of these statements are true

The first statement can't be true since it would contradict itself. So there is at least one False statement - and therefore the last statement must also be False.

The two middle statements can't both be true and can't both be False.

So only the second statement is true and therefore the answer is 1

If the square is completed with the letters A, B, C, D and E so that no row, column or either of the two main diagonal lines contains the same letter more than once, which letter should replace the asterisk?

E			B	
B	*	E		A
		B		E
D	E	C	A	B
	B		E	

The green square must be A since B, C, D and E share a line or diagonal with it.

The purple square must be E since B and E are the only choices and B is on the same diagonal.

So the red square must be B.

The pink square must be E since it is the only remaining

E			B	
B	*	E		A
		B		E
D	E	C	A	B
	B		E	

location for an E on that diagonal.

The orange square must be B since there's no other place for it in that column.

The grey square must be E since there's no other place for it in that column. So the last remaining E goes in the brown space.

Similarly, we can place the last two B's in the yellow spaces.

Case 1 A in blue space

E	C	A	B	D
B	D	E	C	A
C	A	B	D	E
D	E	C	A	B
A	B	D	E	C

Then we can put the rest of the A's in the black spaces

Fill out the third row, fourth column, and * = D.

The rest of the grid can be completed

Case 2 A in blue space

Then we put the rest of the A's in the black spaces

So we put a C in the lime space and a D in the navy space.

But now there is no way to finish the fifth column.

So the answer is **D**

E	A		B	
B	*	E		A
A		B		E
D	E	C	A	B
C	B	A	E	D

In a certain code, $A=1$, $B=2$, $C=3$, etc. Words are encoded by multiplying together the values of their letters, so the code for SQUARE is $19 \times 17 \times 21 \times 1 \times 18 \times 5 = 610470$. Similarly, the code for RECTANGLE is 31 752 000. What is the code for TRIANGLE? (No calc)

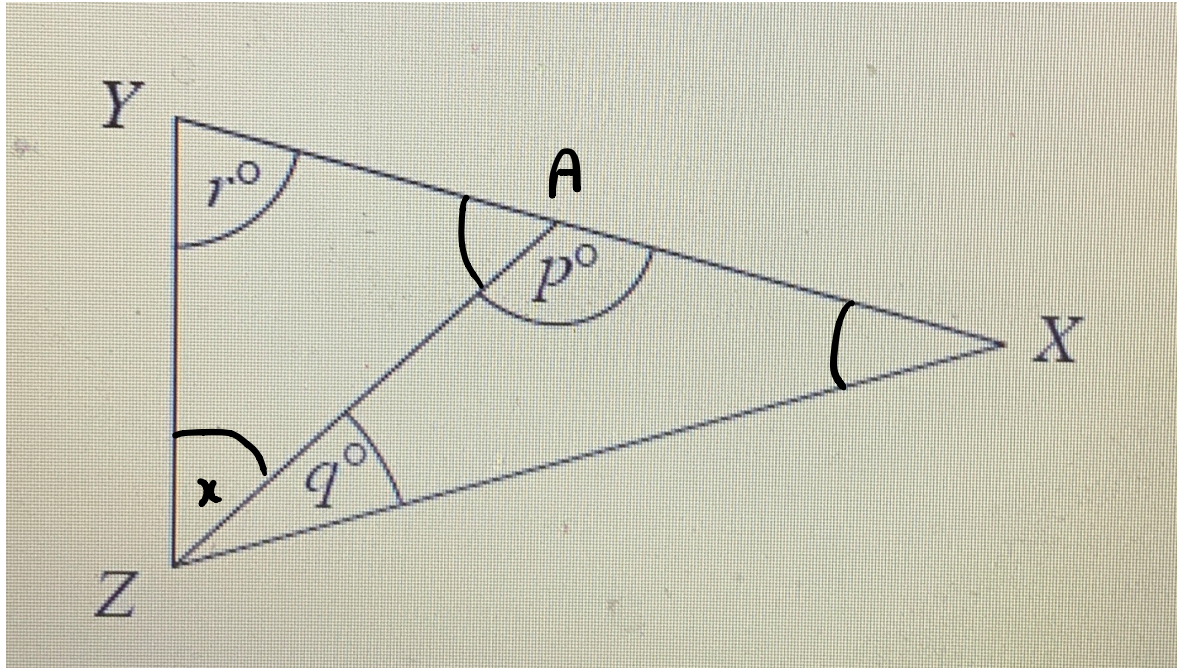
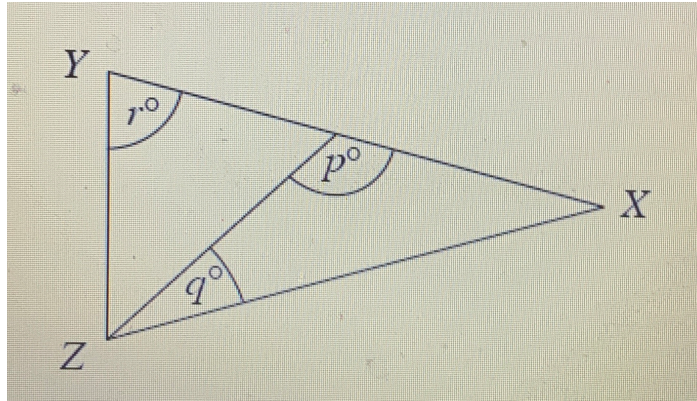
Note that RECTANGLE and TRIANGLE share many of the same letters.

We have

$$\begin{aligned}\text{TRIANGLE} &= \frac{\text{RECTANGLE}}{E \times C} \times I \\ &= \frac{31\,752\,000 \times 9}{5 \times 3} \\ &= \frac{31\,752\,000 \times 3}{5} \\ &= (31\,752\,00 \times 2) \times 3 \\ &= 19051200\end{aligned}$$

Code:	A	B	C	D	E	F	G	H	I
	1	2	3	4	5	6	7	8	9

In the diagram, triangle XYZ is isosceles, with $XY = XZ$.
What is the value of r in terms of p and q ?



Let point A be as shown on the diagram.

We have $\angle YAZ = 180 - p$ (supplementary angles)

Let $x := \angle YZA$

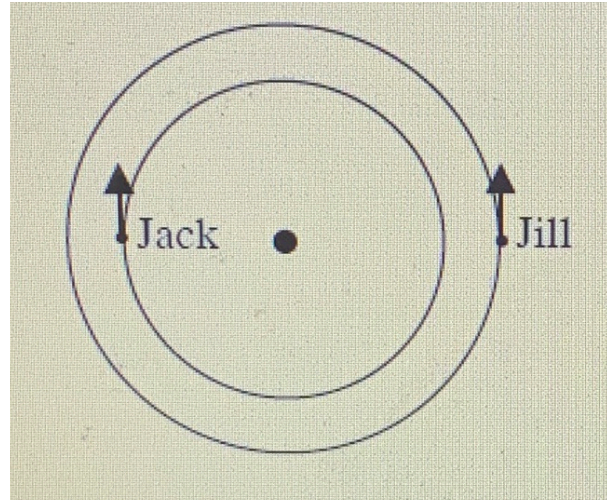
We have $r = x + q$ since $\triangle XYZ$ is isosceles

Also, by angle sum of a triangle:

$$x = 180 - r - (180 - p) = p - r$$

$$\text{So } r = p - r + q \Rightarrow 2r = p + q \Rightarrow r = \frac{p+q}{2}$$

Jack dances clockwise around the Maypole, making one revolution every five seconds. Starting From a point diametrically opposite Jack's starting point, Jill dances anti-clockwise, making one revolution every six seconds. How many times do they pass each other in the first minute?



Jack turns through an angle of $360 \div 5 = 72^\circ$ every second and Jill turns through an angle of $360 \div 6 = 60^\circ$ every second.

Since they are travelling in opposite directions, Jill turns through an angle of $72 + 60 = 132^\circ$ relative to Jack every second.

So in 1 minute, she will turn through an angle of

$$60 \times 132 = 22 \times 360$$

(22 Full revolutions relative to Jack)

A unit cube is coloured blue. Additional blue unit cubes are glued Face-to-Face to each of its six Faces. If unit cubes coloured yellow are now glued Face-to-Face to all Faces of this shape, how many yellow cubes are required?

The cube on the top will share a yellow cube with the Four cubes around the middle (covering their upper faces). Additionally, 1 more yellow cube will be required to cover the upper face of the top cube.

Similarly, the cube on the bottom will share a yellow cube with the Four cubes around the middle, covering their lower faces, and then will require 1 more yellow cube to cover its own lower face.

The four cubes around the middle will share 4 yellow cubes between them, and need 1 extra cube each to cover their outer faces.

So the total number of yellow cubes required is

$$5 + 5 + 4 + 4 = 18$$