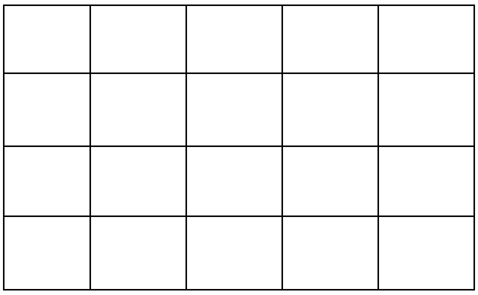
**Primary**

# Example
# Individual problem

## <u>Problem</u>

The figure below is made up of 20 Rectangles.
How many rectangles (of all sizes) are there altogether in the figure?



## So lotion

Write the numbers “1”to”5”in the rectangles on the first row.
Write the numbers “2”to”10” in the rectangles on the second row.
Write the numbers “3”to”15” in the rectangles on the third row.
Write the numbers “4”to”20” in the rectangles on the fourth row.

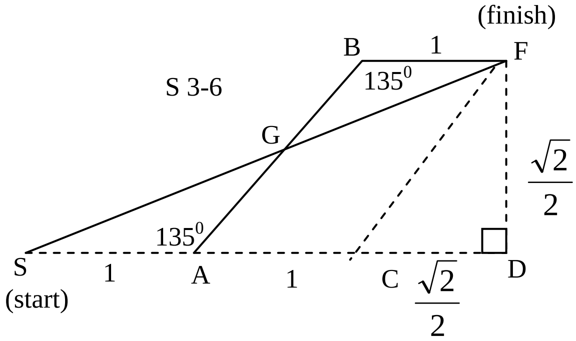
Add up all the numbers to get the sum of 150

| | | | | |
|---|---|---|---|---|
| 4 | 8 | 12 | 16 | 20 |
| 3 | 6 | 9 | 12 | 15 |
| 2 | 4 | 6 | 8 | 10 |
| 1 | 2 | 3 | 4 | 5 |

Answer: 150

# <u>Example</u>
# Individual problem

## Problem
A man walks one mile east, then one mile northeast, then another mile east (Fig. S3-6).Find the distance, in miles, between the man's initial and final positions.




## Solution

Let $S$ and $F$ be the starting and finishing positions, respectively.
Draw $\overline{FD} \perp \overleftrightarrow{SA}$, then draw $\overline{FC} \parallel \overline{AB}$.
In rhombus $ABFC, CF = BF = AC = 1$(#21−1); also $AS$ = 1.

In isosceles right $\Delta FDC, FD = CD = \frac{\sqrt{2}}{2}$(#55$b$).

Applying the Pythagorean Theorem (#55) to right $\Delta DSF$,

$$(FD)^2 + (SD)^2 = (SF)^2$$

$$\left(\frac{\sqrt{2}}{2}\right)^2 + \left(2 + \frac{\sqrt{2}}{2}\right)^2 = (SF)^2$$

$$\sqrt{5 + 2\sqrt{2}} = SF.$$

# Example
# Team problem

**Problem**

A bag contains two red cabbages and three green cabbages. Tracy, who is blindfolded, randomly selects one of the cabbages and places it in an empty pan. Then she randomly selects a second cabbage from those remaining in the bag and also places that in the pan. What is the percentage likelihood that of the two cabbages that are now in the pan, one is red and the other is green?

## So lotion

Method 1: from first principles.
We name the cabbages $R_1, R_2$ (the red cabbages) and $G_1, G_2 G_3$ (the green cabbages).
There are twenty possible selections of two cabbages from the set:

| | | | | |
|---|---|---|---|---|
| $R_1R_2$ | $R_2R_1$ | $G_1R_1$ | $G_2R_1$ | $G_3R_1$ |
| $R_1G_1$ | $R_2G_1$ | $G_1R_2$ | $G_2R_2$ | $G_3R_2$ |
| $R_1G_2$ | $R_2G_2$ | $G_1G_2$ | $G_2G_1$ | $G_3G_1$ |
| $R_1G_3$ | $R_2G_3$ | $G_1G_3$ | $G_2G_3$ | $G_3G_2$ |

All twenty selections are equally likely and twelve of them involve one cabbage of each co lour.
So the percentage likelihood is $\frac{12}{20} \times 100\% = 60\%$
Method 2: for those who know something of the theory of probability.

$$Prob.\begin{pmatrix} one\ red \\ and \\ one\ green \end{pmatrix}$$

$$= Prob.\begin{pmatrix} first\ is\ red \\ and \\ second\ is\ green \end{pmatrix} + Prob.\begin{pmatrix} first\ is\ green \\ and \\ second\ is\ red \end{pmatrix}$$

$$= Prob.\begin{pmatrix} first \\ is \\ red \end{pmatrix} \times Prob.\begin{pmatrix} second\ is\ green \\ given\ that \\ first\ is\ red \end{pmatrix}$$

$$+ Prob.\begin{pmatrix} first \\ is \\ green \end{pmatrix} \times Prob.\begin{pmatrix} second\ is\ red \\ given\ that \\ first\ is\ green \end{pmatrix}$$

$$= \frac{2}{5} \times \frac{3}{4} \times \frac{3}{5} \times \frac{2}{4} = \frac{12}{20}.$$

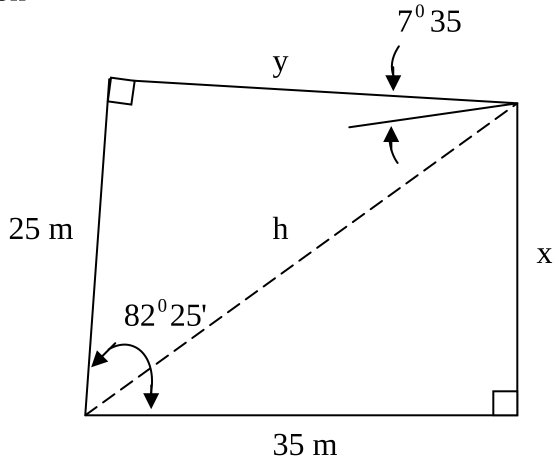
So the percentage likelihood is $\frac{12}{20} \times 100\% = 60\%$.

# <u>Example</u>
# Team problem

## Problem
Me Board, April 1981

A corner lot of land is 35m on one street and 25 m on the other street, the angle between the two liner of the street being $82^0\ 25'$. The other two lines of the lot are respectively perpendicular to the lines of the streets. What is the worth of the lot at 180 per sq. m

Solution




By Pythagorean Theorem:

$$x^2 + (35m)^2 = h^2$$

$$y^2 + (25m)^2 = h^2$$

$$\therefore x^2 + 1225 = y^2 + 625$$

$$y^2 = x^2 + 600 \ldots\ldots\ldots\ldots (1)$$

$$25\sin 82^0 25' = x + y \sin\ 7^0 35'$$

$$24.781 = x + 0.132y \ldots\ldots\ldots (2)$$

From (2) . $x = .24.781 - 0.132y$

Thus. $y^2 = (24.781 - 0.132y)^2 + 600$

$$y^2 = 614.098 - 6.542y + 0.0174y^2 + 600$$

$$0.9826y^2 + 6.542y - 1214.098 = 0$$

$$y^2 + 6.6578y - 1235.6 = 0$$

By Quadratic Formula:

$$y = \frac{-6.6578 + \sqrt{(6.6578)^2 - 4(-1235.6)}}{2}$$

$$y = 31.98m$$

Thus $x = 24.781 - 0.132(31.98)$

$$= 20.56m$$

Also, $x = \sqrt{y^2 - 600}$

$= \sqrt{(31.98)^2 - 600}$

$= 20.56m$

Therefore, The total area of the lot is

$$A = \frac{1}{2}(25m)y + \frac{1}{2}(35m)x$$

$$= \frac{1}{2}(25m)(31.98m) + \frac{1}{2}(35m)(20.56m)$$

$$= 759.55 sq.m$$

Therefore, shaded area

$$A = \frac{1}{2}(225\pi) - 180$$

$$= 173.43 cm^2 \qquad \text{ans.}$$

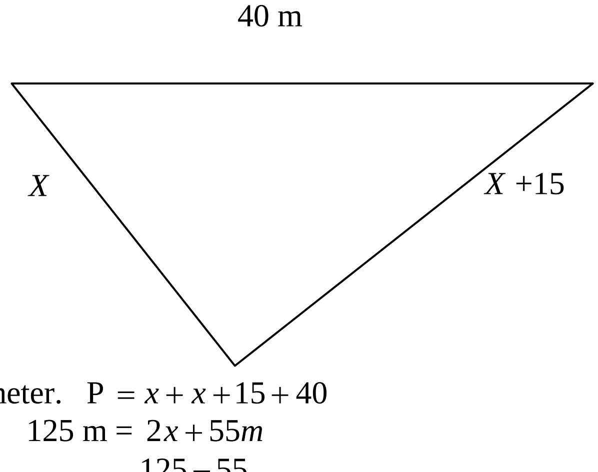
# Problem

Me Board, April 1991

A mason was asked to compute the number of hollow blocks. Which have to be purchased to fence one side of a triangular lot in which the two other sides have already been fenced by adjoining lot owners. One of the fenced sides is 40 m long and the other is m longer than the side to be fenced. If the total length of the three sidles is 125 m, the height of the fence required is 2436 mm and the length of each hollow block is 406 mm while the width is 203 mm, find the number of hollow blocks that have to be purchased, allowing an additional 10% for breakages. Disregard the effect of posts on the required number of hollow blocks.

Solution:

Let x = length of side to be fenced.




Perimeter. P $= x + x + 15 + 40$

125 m = $2x + 55m$

$$\therefore x = \frac{125 - 55}{2} = 35m$$

Total area of fence

$= 35{,}000$ $mm$ x $2436$ $mm$

$= 85{,}260{,}000$ $mm^2$

Area of one hollow block

$= 203mm x 406mm,$

$= 82\ 418 \quad mm^2$

Number of hollow blocks needed

$$= \frac{85\ 260\ \ 000}{82\ 418}$$

$= 1034.48$

With 10% allowance for breakages, number of hollow blocks to be our chased

$= (1 + 10\%)1034.48$

$= 1138 \ \ pieces \qquad\qquad ans.$