

















WHAT'S IT WORTH?

28

30

18

20

?

30





23

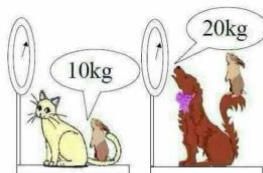
22

Each shape has a different value. The totals for the rows and columns are given. Can you find the values of the shapes and the total of the first column?

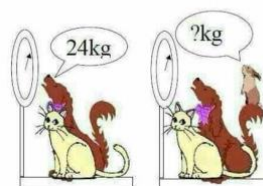
HELP

In problem solving it often helps to try simple cases. Here two blue shapes a green and a red add up to 12, and a green and a red add up to 8. So two blue shapes add up to 4.

		5
		7
?	8	



In the weighing problem, a cat, a dog and 2 rabbits together weigh 30 kg and a cat and a dog together weigh 24 kg. So 2 rabbits weigh 6 kg and 1 rabbit weighs 3 kg. All three animals weigh 24 kg + 3 kg, that is 27 kg.



NEXT

Create your own puzzle and give it to another learner to solve.

At first you could use the same grid as for What's it Worth but to change the values of the shapes and then write in your own totals leaving some totals for another learner to discover.

Then you might like to invent other puzzles like the weighing puzzle.

NOTES FOR TEACHERS

SOLUTION

There are many possible methods and this is just one of them. It is important to allow learners to find their own methods.

From the last 2 rows the square is worth 2 more than the triangle: **square - triangle = 2**

From the top row two squares and two triangles add up to 28. This means

2 triangles plus 4 plus another two triangles gives 28.

So four triangles are worth 24. **A triangle is worth 6 and a square is worth 8.**

From the bottom row 3 circles plus a square gives 20,

3 circles + square = 20 so 3 circles + 8 = 20 so

3 circles = 12 and a circle is worth 4.

From the second row **2 hexagons + 2 squares = 30 so**

2 hexagons + 16 = 30 so 2 hexagons = 14 so a hexagon is worth 7.

Checking the third column: **square + hexagon + 2 circles = 8 + 7 + 8 = 23.**

The first column adds up to 6 + 7 + 8 = 21.

Diagnostic Assessment This should take about 5–10 minutes.

1. Write the question on the board, say to the class:
“Put up 1 finger if you think the answer is A, 2 fingers for B, 3 fingers for C and 4 fingers for D”.
2. Notice how the learners responded. Ask a learner who gave answer A to explain why he or she gave that answer and DO NOT say whether it is right or wrong but simply thank the learner for giving the answer.
3. Then do the same for answers B, C and D. Try to make sure that learners listen to these reasons and try to decide if their own answer was right or wrong.
4. **Ask the class again to vote for the right answer by putting up 1, 2, 3 or 4 fingers. Notice if there is a change and who gave right and wrong answers.** It is important for learners to explain the reason for their answer otherwise many learners will just make a guess.
5. If the concept is needed for the lesson to follow, explain the right answer or give a remedial task.

B. is the correct answer.

Common Misconceptions

Learners who answer **A. C. or D.** are either just guessing or don't understand what the \times and $=$ symbols mean or have a poor understanding of multiplication and division.

This provides a good lesson starter where the teacher can ask learners to explain how they got the answer 10 so helping them to develop their logical reasoning and communication skills. Then the teacher can bring out the idea of **DOING THE SAME TO BOTH SIDES** to keep them equal.

$$5 \times 4 = 2 \times \triangle$$

The value of \triangle is;

A

5

B

10

C

20

D

40

<https://diagnosticquestions.com>

Why do this problem?

This activity gives a good bridge between number work and algebra and learners can work on it without any algebraic notation. This is a pre-algebra task that challenges learners to reason about several unknowns, to look for ways to record the information given and to use the information given to find the unknowns. It introduces learners to the sort of manipulations that can be used to solve simultaneous equations. Later the activity can be used to progress from words to formulas (for example 'two triangles and two squares are worth 28' can be written $2t + 2s = 28$).

Intended learning outcomes

For learners to:

1. develop logical reasoning and written and oral communication skills;
2. find their own methods for solving simultaneous equations without using any algebraic notation or formal procedures.

Suggestions for Teaching

Show the grid and tell the learners that:

"Each symbol has a numerical value. The total for the symbols is written at the end of each row and column."

"This is a really interesting problem because it can be solved in lots of different ways."

"Can you find more than one way to do it?"

"Can you find the missing total that should go where the question mark has been put?"

"There's a lot of information in the grid, so make your own choice about where to start."

Learners could work in pairs to make sense of the different methods. The problem could also be solved by trial and improvement, by inviting learners to choose a value for a particular shape and explore the consequences.

Finish the lesson by inviting learners to the board to share their answers and explain their methods.

Key Questions

Here are some prompts that could be offered to learners working on the different approaches if they get stuck:

What is the same and what is different about the bottom two rows?

What can you deduce by comparing the bottom two rows?

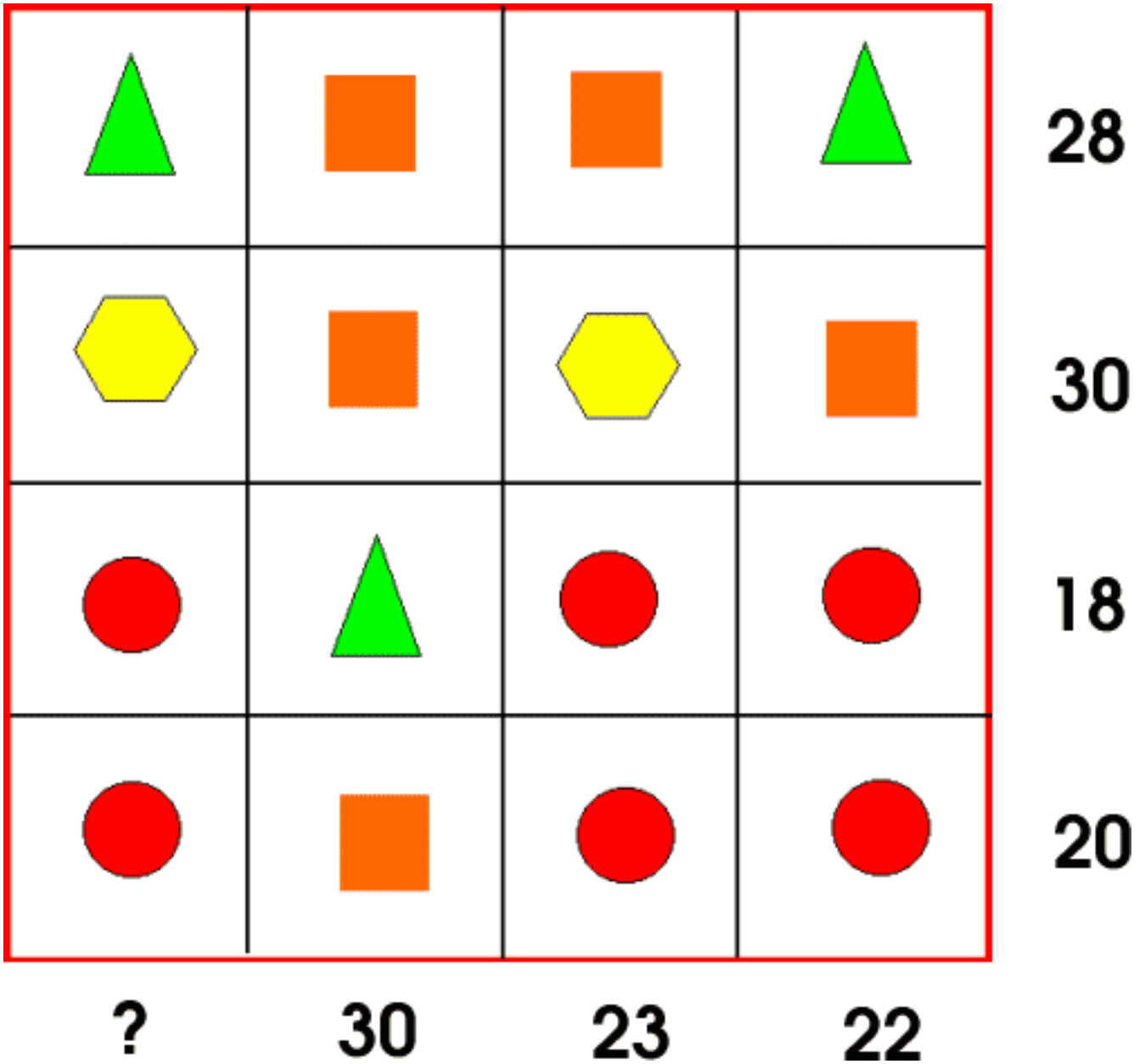
What do you notice about the top 2 rows? What does that tell you?

Is the triangle worth more or less than the square? How do you know?

If you could work out the value of the triangle how could you then work out the value of square?

If you could work out the value of the square how could you then work out the value of circle?

If you could work out the value of the square how could you then work out the value of hexagon?



Note: The Grades or School Years specified on the AIMING HIGH Website correspond to Grades 4 to 12 in South Africa and the USA, to Years 4 to 12 in the UK and up to Secondary 5 in East Africa.

Note: The mathematics taught in Year 13 (UK) and Secondary 6 (East Africa) is **not** included in the school curriculum for Grade 12 SA.

	Lower Primary or Foundation Phase Age 5 to 9	Upper Primary Age 9 to 11	Lower Secondary Age 11 to 14	Upper Secondary Age 15+
South Africa	Grades R and 1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
USA	Kindergarten and G1 to 3	Grades 4 to 6	Grades 7 to 9	Grades 10 to 12
UK	Reception and Years 1 to 3	Years 4 to 6	Years 7 to 9	Years 10 to 13
East Africa	Nursery and Primary 1 to 3	Primary 4 to 6	Secondary 1 to 3	Secondary 4 to 6