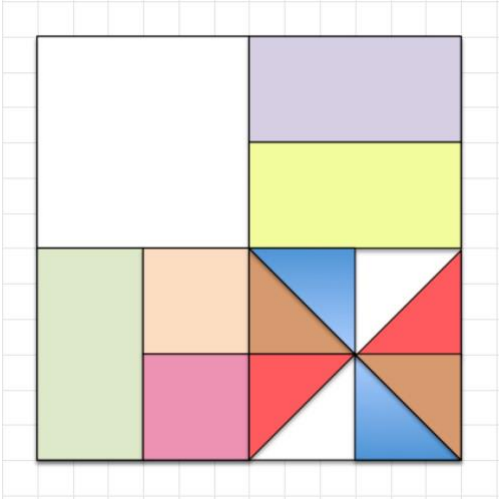
AIMSSEC

AFRICAN INSTITUTE FOR MATHEMATICAL SCIENCES
SCHOOLS ENRICHMENT CENTRE
TEACHER NETWORK

FRACTIONS BY HALVES



The square is one unit and it is split into smaller parts.

Label each part with the fraction it shows.

Which coloured bits would you use to show that two eighths equals one quarter $\frac{2}{8} = \frac{1}{4}$?

Which coloured bits would you use to show that two sixteenths equals one eighth $\frac{2}{16} = \frac{1}{8}$?

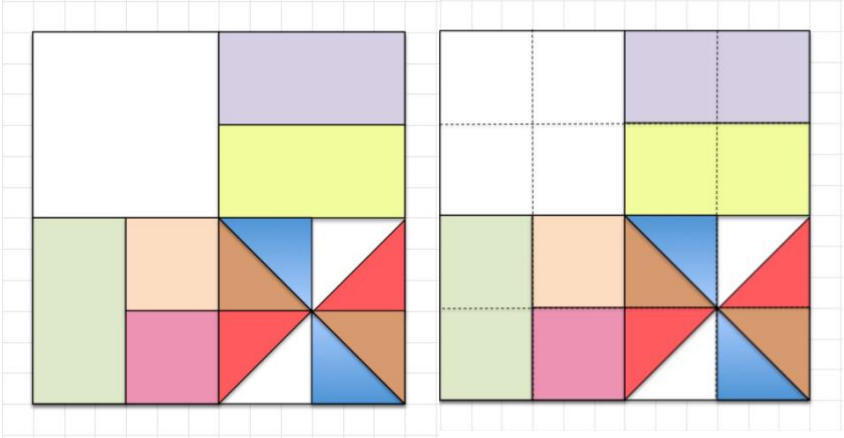
What can you say about the fractions shown by the triangles?

How many small pink squares give the same fraction as the three white bits taken together?

Write down fractions that add up to one half in different ways using the fractions shown in the diagram.

Draw your own pattern in a square and label the fractions in your pattern.

HELP



Use the original picture with this 4 by 4 grid. Can you now see that 16 of the smallest squares make up one unit so they represent the fraction $\frac{1}{16}$.
That should help you to answer the original questions.

NEXT

Play the **Fractions By Halves Game** for 2 players or 2 teams.

Copy the pattern onto thick card and draw a frame around it. Use a knife to cut out the 14 pieces leaving the frame intact and produce:

$\frac{1}{4}$ (1 piece), $\frac{1}{8}$ (3 pieces), $\frac{1}{16}$ (2 pieces), $\frac{1}{32}$ (8 pieces).

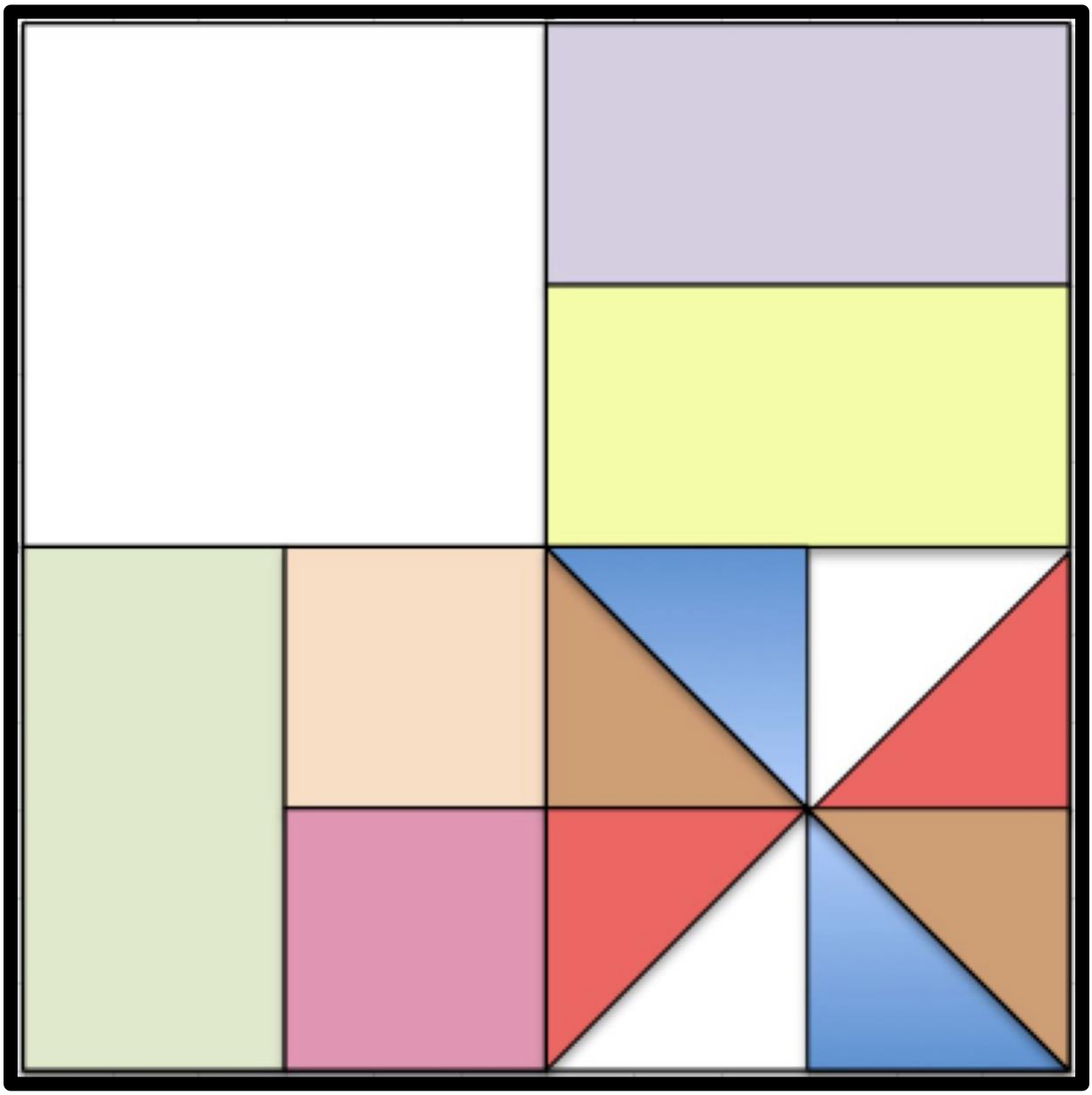
Put in a bag 14 identical cards with the fractions $\frac{1}{4}$ written on one card, $\frac{1}{8}$ written on 3 cards, $\frac{1}{16}$ on 2 cards and $\frac{1}{32}$ on 8 cards.

The first player randomly picks 2 cards, selects 2 puzzle pieces that match the fractions on those cards and places them in the frame, then adds the 2 fractions. The second player does the same and they do this alternately until there are no cards left.

For example, a green and a red piece make $\frac{1}{8}+\frac{1}{32}=\frac{5}{32}$. On each round the players must agree on the totals and the player with the largest total score wins a point.

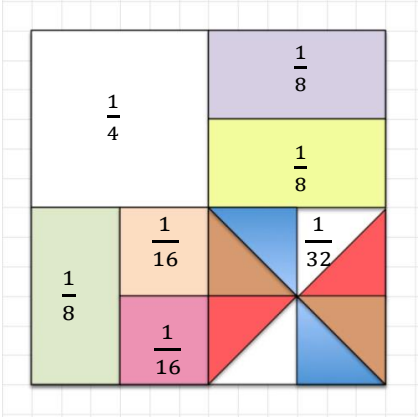
FRACTIONS BY HALVES GAME

Cut out the 14 square, rectangular and triangular pieces separately leaving the outer frame intact.



NOTES FOR TEACHERS

SOLUTION



The lilac and yellow bits are eighths and together they make one quarter showing $\frac{2}{8} = \frac{1}{4}$.

The pink and beige bits are sixteenths and together they make one eighth showing $\frac{2}{16} = \frac{1}{8}$.

Two triangles are equivalent to $\frac{1}{16}$.

Four triangles are equivalent to $\frac{1}{8}$.

Eight triangles are equivalent to $\frac{1}{4}$.

Sixteen triangles are equivalent to $\frac{1}{2}$.

Thirty two triangles are equivalent to 1 unit.

Each triangle is equivalent to $\frac{1}{32}$.

Five small pink squares are equivalent to the white bits taken together showing:

$$\frac{1}{4} + \frac{2}{32} = \frac{1}{4} + \frac{1}{16} = \frac{4}{16} + \frac{1}{16} = \frac{5}{16}$$

The diagram shows six different ways of writing down fractions that add up to one half:

$\frac{1}{2} = \frac{1}{4} + \frac{2}{8}$ (white, lilac and yellow);

$\frac{1}{2} = \frac{1}{8} + \frac{2}{16}$ (white, green, beige and pink);

$\frac{1}{2} = \frac{3}{8} + \frac{2}{16}$ (lilac, yellow, green, beige and pink);

and, using the triangular bits $\frac{1}{2} = \frac{1}{4} + \frac{8}{32}$; $\frac{1}{2} = \frac{1}{8} + \frac{2}{16} + \frac{8}{32}$; $\frac{1}{2} = \frac{2}{8} + \frac{8}{32}$

Why do this activity?

By doing this activity learners use and develop their visualising skills in conjunction with the knowledge of fractions. It's a richer activity than just dealing with fractions numerically.

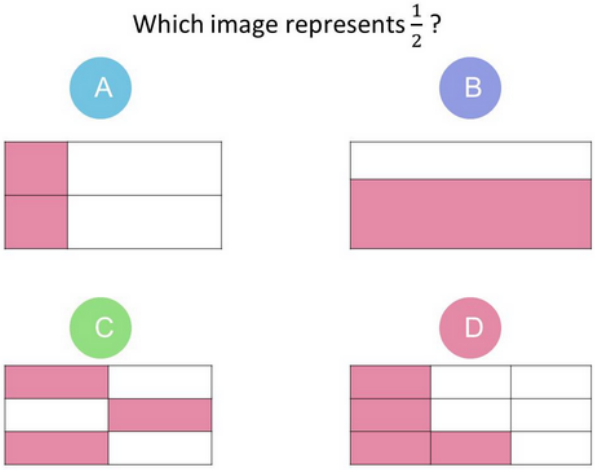
Intended learning outcomes

Learners will practice:

- Addition and subtraction of common fractions in which one denominator is a multiple of another
- Recognizing and using equivalent forms of common fractions with 1-digit or 2-digit denominators.

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.
5. If the concept is needed for the lesson to follow, explain the right answer or give a remedial task.



C. is the correct answer. All the sections are equal which is a needed to show a fraction, 3 of the 6 are coloured in, 3 is half 6 so a half is shown.

Common Misconceptions

A. The student may think that as 2 of the 4 are coloured in it represents a half.

B. The student may think that as 1 strip is not coloured and 2 are coloured it shows a half.

D. The student may think that as the shaded ones are on one side and the non shaded on the other it shows a half.

https://diagnosticquestions.com

Suggestions for Teaching

The learners should have a copy of the question. You may like to photocopy this from the top half of page 1 or copy it on the board. Emphasise to learners that the square represents ONE UNIT and the challenge is to find information about the fractions represented by the different parts of the square.

Start by asking the learners to mark the fractions on the smaller bits of the picture. This could be done on the board with different learners suggesting the labels ($\frac{1}{4}, \frac{1}{8}, \frac{1}{16}, \frac{1}{32}$) and giving reasons for their choices.

You might choose to let the learners work in pairs and then conduct a class discussion asking learners about the different ways of writing a sum of fractions that add up to one half.

Key questions

What shapes have you found?

Which is the biggest/smallest shape?

How many of that shape would you need to make up one unit?

Tell me how you found this out?

How many triangles are equivalent to $\frac{1}{16}$?

How many triangles are equivalent to $\frac{1}{8}$?

How many triangles are equivalent to $\frac{1}{4}$?

How many triangles are equivalent to $\frac{1}{2}$?

How many triangles are equivalent to 1 unit?

Follow up

Encourage learners to create their own problems for others to solve.
See FRACTIONS BY THIRDS https://aiminghigh.aimssec.ac.za/fractions-by-thirds/ and CHOCOLATE https://aiminghigh.aimssec.ac.za/chocolate/ .