Abacus

What better time in the school year than now to take a look at some real geometry and to think about interesting games for those cold winter days. From my own elementary school days I recall the joy of cutting out paper snowflakes and stars to decorate the school as well as the special board games the teacher would allow us to play at recess time. Conversations with elementary grade teachers suggest this journal publish some ideas that could be taken home too. I am indeed pleased to present activities that will meet the need.

At the May '96 OAME conference in London I invited **Jane Felling** from **Box Cars & One-Eyed Jacks, Edmonton, Alberta** to write an article for us. She is co-author of a three volume series of books by the same name. The box cars are dice and these books are all about math games for kids using dice and cards. The games described in each volume cover numeration, arithmetic operations (fraction dice are available), data gathering and problem solving. The authors have combined their experiences in elementary and special education teaching to provide fun and motivation in elementary math programs from kindergarten to seniors. A game can be chosen to introduce a concept, practice a skill or master a topic.

Jane is a promoter of math backpacks. For the workshop "find a seat and get ready to play" was her opening line. Most of the participants in the session left with math backpack ideas.

Why Math Games Backpacks?

1. Many primary students are used to taking home readers or other activities. Why not "add" some math for a change.
2. Children are normally eager to play games. Math games are as willingly played by our most reluctant math students as by our math whizzes.
3. They are a welcome change for parents who often are frustrated by the struggle to get homework completed. Parents and children become partners in a game and the setting is relaxed. Cards and dice replace paper and pencil.
4. Games can be individualized for student's needs.

Getting Started

Use the Meet the Teacher meeting to discuss the purpose of at-home practice with math games. **Odd or Even** is an excellent choice for a starter or first game in the mathpack. Communication is important. Jane recommends that an introductory letter go home to parents in the first backpack to suggest the parents try 10 to 15 minutes a day and to provide the rules for returning the packs to school as well as guidelines about the games component of the child's math program. To strengthen the home link, give parents an opportunity to comment on each math-game experience. **Addition War** is an example of a game that is suitable for players of different skill levels. **Combo Five** is reprinted with permission from **Box Cars & One-Eyed Jacks Vol III, 1996.**

Grades 4 and up will find **Make a Tetrahedral Gift Box** by **Catherine Ross, London, Ontario** gives experience with manipulatives in the spatial sense and geometry strand. What better way to observe geometrical properties than by using compass, scissors and folding tricks to create a useful three-dimensional figure. Recall that a tetrahedron is a geometrical shape with four triangle faces.

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All elementary school children enjoy working with tangrams and the junior grades can have fun making their very own tangrams with the help of **Tangrams Through Paper Folding** by **Robert Jones, LWCDinc., St. Louis, Missouri.** This is an example from his book **Paper Folding** that he wrote to provide hands-on activities to help junior students discover math concepts.

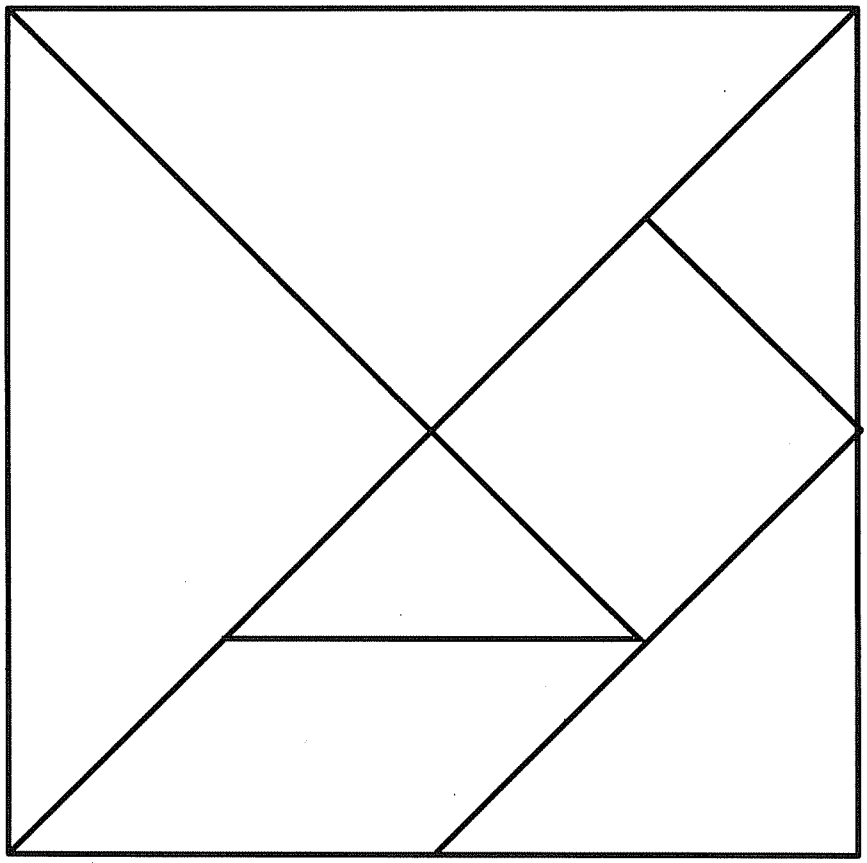
Thank you Catherine Ross, Jane Felling and Robert Jones for providing *Abacus* readers with motivational and fun mathematics.

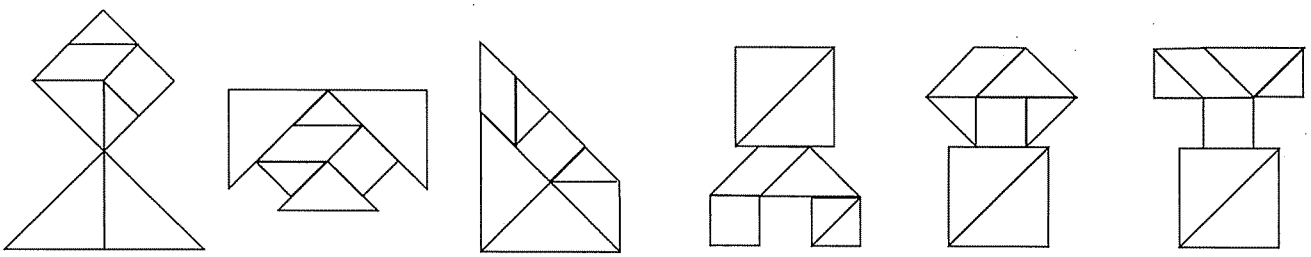
Readers, don't forget to have your students send in entries for the September issue contests. I can see *Abacus* is going to have an interesting title page beginning with the March, l997 issue. Submissions, comments, special requests and questions are always welcome.

Frances Schatz

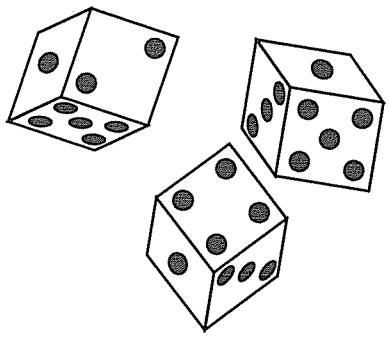
SOLUTIONS

Tangram Puzzles





Odd or Even

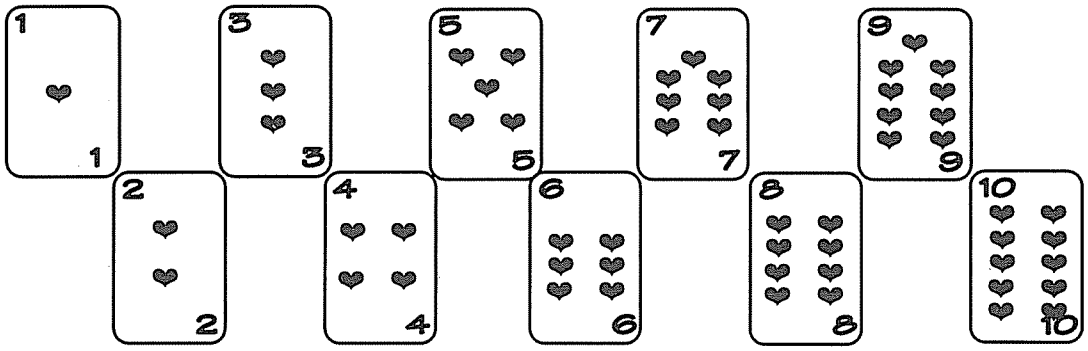


Skills: Addition to ten, odd and even

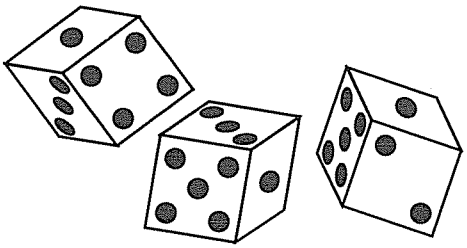
Players: Two or more

Equipment: Each player cards (Ace=1) - 10
Two dice with faces 1-6

Start: Each player arranges the ten cards as follows:



Before players begin, they predict which set of numbers they will eliminate first: either the odd or the even set. Players then take turns rolling one or two dice and begin eliminating sums of their rolls.



Example:

- Roll 2 and 4: remove 6
- Roll 5 and 3: remove 8

Players continue to take turns until one player has removed all cards. This player earns 10 points for doing so. If the player also made a correct prediction, then the player earns 5 more points.

- Play continues to 50 or l00 points.

Variation: Encourage players to add or subtract the dice before removing cards. Have players remove up to two cards per roll.

Addition War

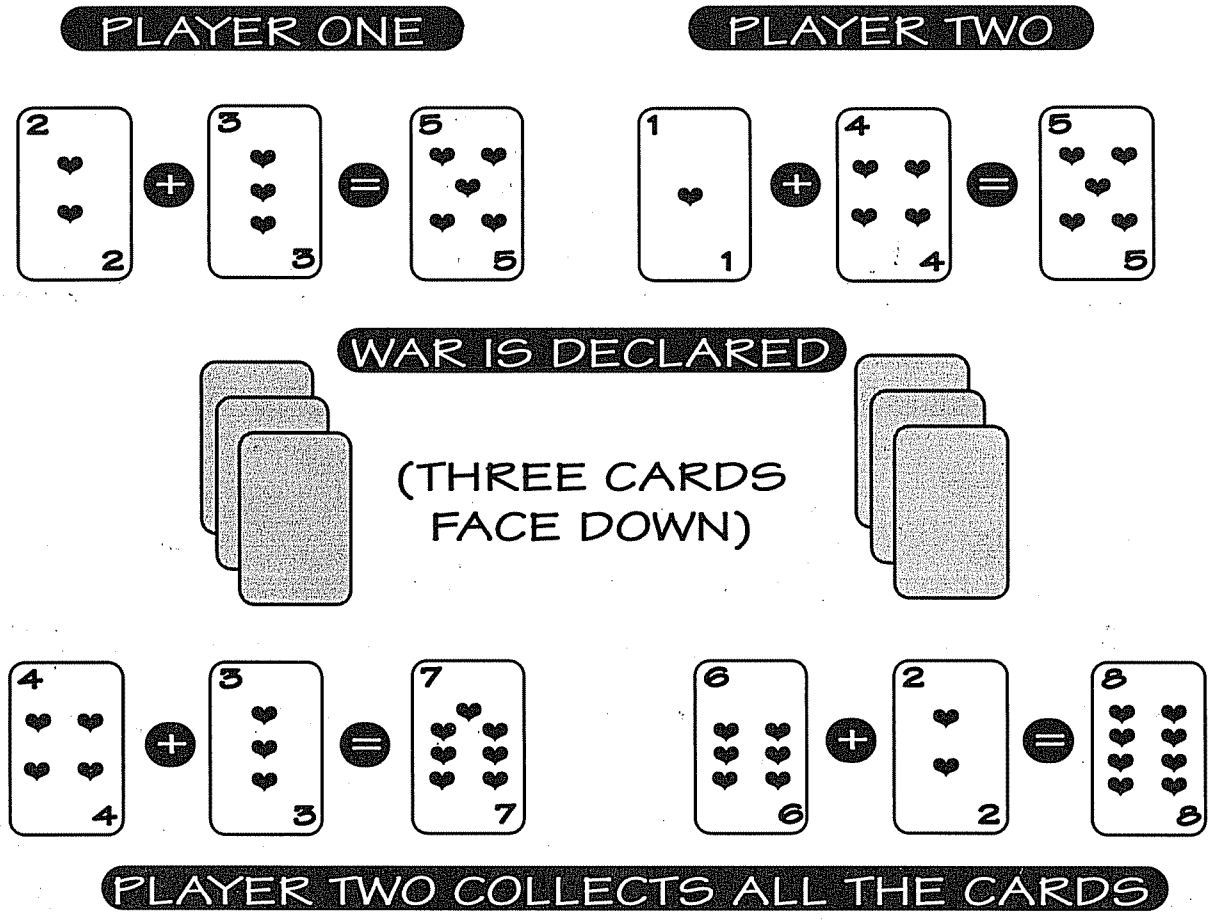
Skills: Addition

Players: Two

Equipment: Grades 1-2 (ace=1), 5 Grades 2-3 (ace=1), 9

Start: Players divide cards evenly between themselves. Each player turns over two cards and adds them together. The higher sum gets all the cards. In the event of a tie (each player has the same sum), WAR is declared. Each player deals out three more cards face down and then turns over two more cards. These two cards are added together. The higher sum wins all the cards. Play continues until one player has collected all the cards dealt.

Example:



Variation: Vary the number of cards to modify the level of difficulty; for example, three cards/player gives a sum such as 23 + 6.

Combo Five

Level: Grade 3 and up

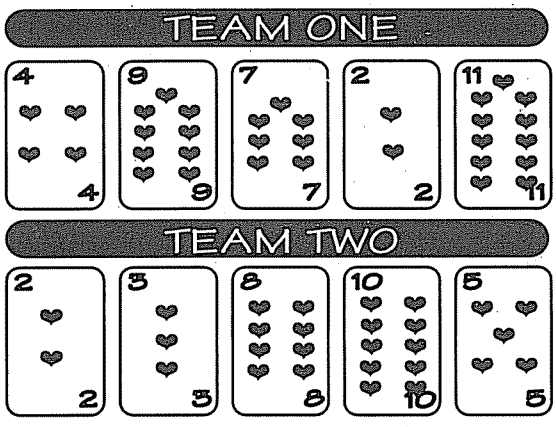
Skills: Mixed operations (add, subtract, multiply, divide), problem solving

Players: Teams of 2 vs. 2

Equipment: One 20-sided die, cards Ace(1)-10, Jack(11), Queen(12), King(0)

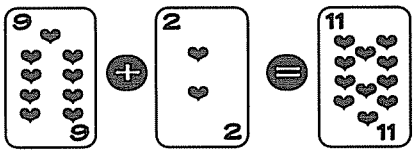
Start: Both teams take 5 cards and place them face up. The goal of the game is to equal the rolled target number each round. To begin, one team rolls the target number for the round. This number will be used by both teams. Teams now begin finding combinations that equal the target number rolled - all operations may be used. A single card cannot be taken off. Teams may take off two, three, four or five card combinations. Teams may also take off a two card and three card combination, or two-two card combinations leaving one card behind for the next round. Each card may only be used once in any combination (ie., in the following example 4 can only be used once and not again in a second combination).

Example: Cards drawn are as follows:



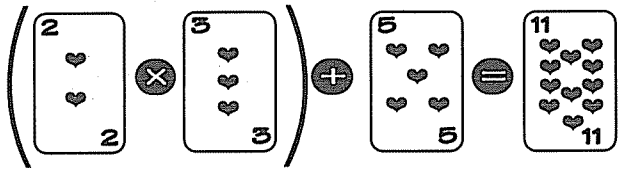
Target rolled = 11

Team One made the following combinations and removed the cards as follows:



leaving behind the 11 card as it was not used in any combination.

Team Two made the following combinations and removed the cards as follows:



leaving behind the **8** and **10** cards. Cards used in any combination are placed in the team's point pile and will be counted at the end of the game to determine the winner. After each round both teams replenish their five cards. Team One in the above example will draw four new cards and Team Two will add three new ones as **8** and **10** were left behind.

A new target is rolled and players work with their new target and card combinations.

Variations: To decrease the level of difficulty have players look for adding and subtracting combinations only.
Example: Target rolled = 6.
Team One cards are 6, 8, 2, 7, 5;
Team Two cards are 3, 9, 4, 8, 10.
Team One makes the combination and removes the cards for: (7+5)-6 and 8-2.
Team One was successful in using all 5 cards.

Score: After a set period of time teams count their cards in their point piles. Winner has the most points.

Make a Tetrahedral Gift Box

Materials:

Paper - any size and colour.
Pencil
Compass
Scissors
Sticky clear tape

Steps:

1. Draw the largest circle your compass will make. Mark the centre of the circle with a dot. Cut out the circle.
2. To get the first side of a triangle, fold any point on the outside (circumference) of the circle so that the point touches the centre dot.
Fig I

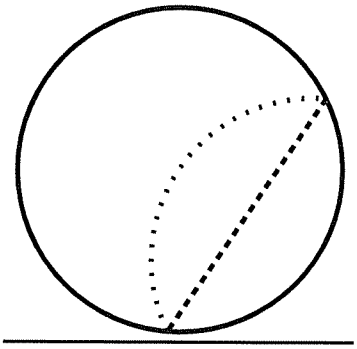


Fig 1

3. Start the second fold at one end of the first fold line so that circumference touches the centre dot.
4. Make the third side of the triangle by folding the remaining circumference to touch the dot.
Fig 2

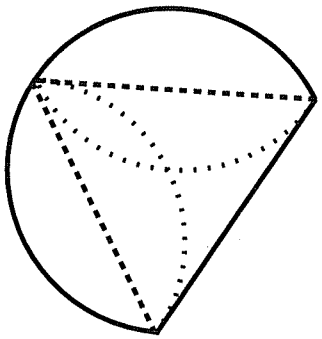


Fig 2

Note: If your triangle doesn't have three sharp, well-formed angles, unfold and start again.

5. Fold one of the sides in half to find its midpoint. Fold the opposite vertex down to touch this midpoint. Sharpen the fold line by running your thumbnail over it. You now have a small triangle between two others.
Fig 3
6. Fold the outside triangles on top of the inside triangle. Crease the fold lines.
7. To form a tetrahedron, join the vertices of the original large triangle as shown in **Fig 4.** Put your present inside, tape the sides shut, and add a celebration bow if you like.

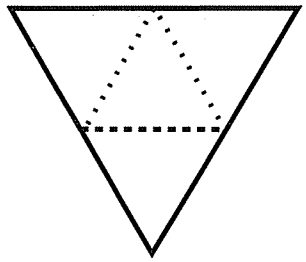


Fig 3

Variations: If you want a gift box that is larger, trace a large round object onto paper. Cut out the circle and fold in half twice to find the circle's centre at the intersection of the two fold lines. If you want a gift box for a flat present, do steps I-6 then:

7. Unfold to get the original large triangle. Fold the vertices in to touch the dot at the centre of the circle. Crease the fold lines and now you have a hexagon. Fold the sides up and interlock to make this flattened shape. Put your present inside and tape your box shut.

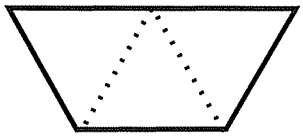
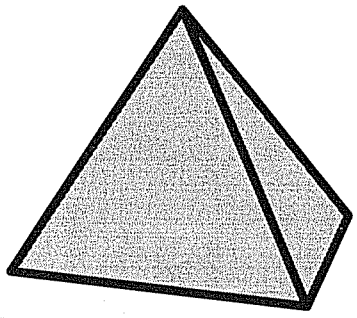


Fig 4

For other ideas:
Ross, Catherine S. *Triangles: Shapes in Math, Science and Nature.* Toronto: Kids Can Press, 1994.



Tetrahedral box
4 Triangular Faces

Tangrams Through Paper Folding

To Make a Square

Take a sheet of paper and fold it **Fig A**. Cut off the portion to the right of the triangle.

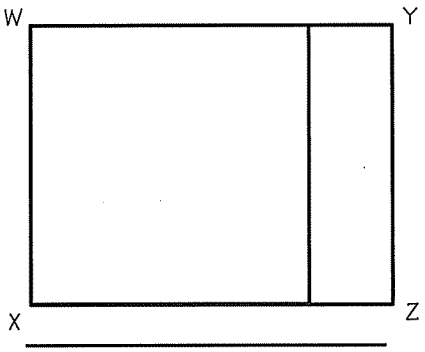
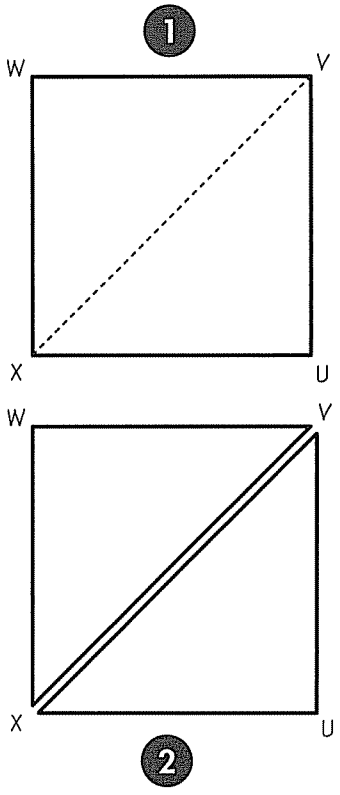
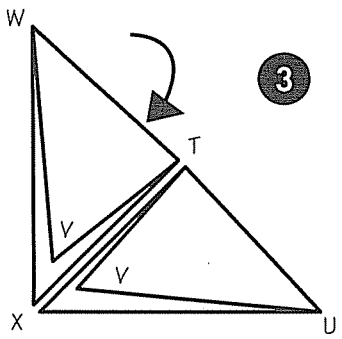


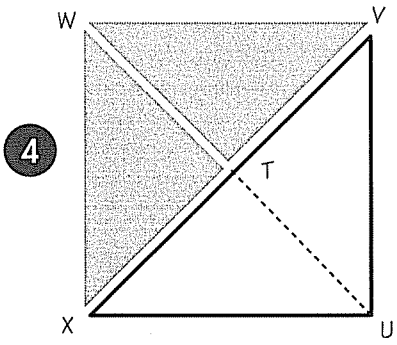
Fig A

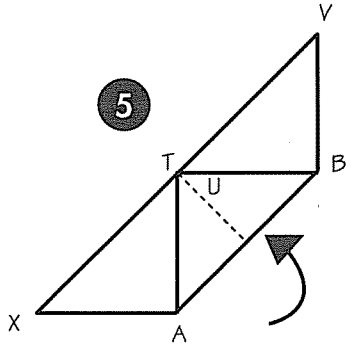
Steps:

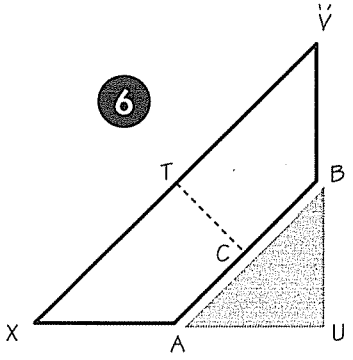
1. Take your square WXUV. Fold a crease through points X and V.
2. Cut the square along the crease to produce two triangles.
3. Fold both triangles as shown and crease. Open both triangles back up.
4. Cut one triangle on the crease that was formed in the last step. Set these two pieces aside.
5. Take the other triangle and fold it so that corner U lines up with the crease on edge VX.
6. Unfold the small triangle that was folded in step 5 and cut along the crease.Set this shape aside for now.
7. Fold tip V of the remaining shape so that the fold passes through point B and the tip V falls on the crease at point T.

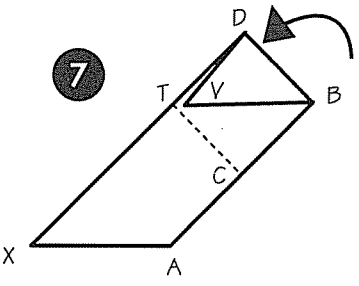


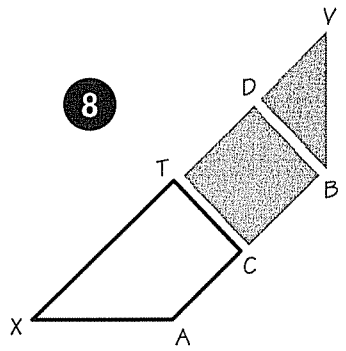


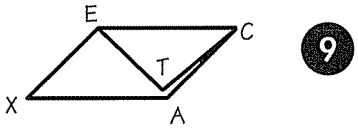


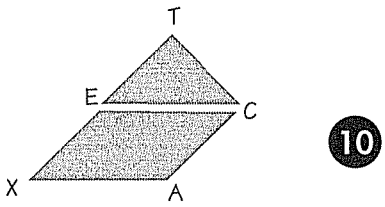












8. Unfold and cut the shape along the two creases BD and TC. This gives two more pieces for your tangram.

9. Fold the remaining shape so that corner T is on corner A and the crease goes through corner C and crease.

10. Unfold the shape and cut along the crease. Your 7-piece tangram puzzle is now complete.

Solutions shows the location of each of the seven tangram puzzle pieces that were produced using steps I-10.

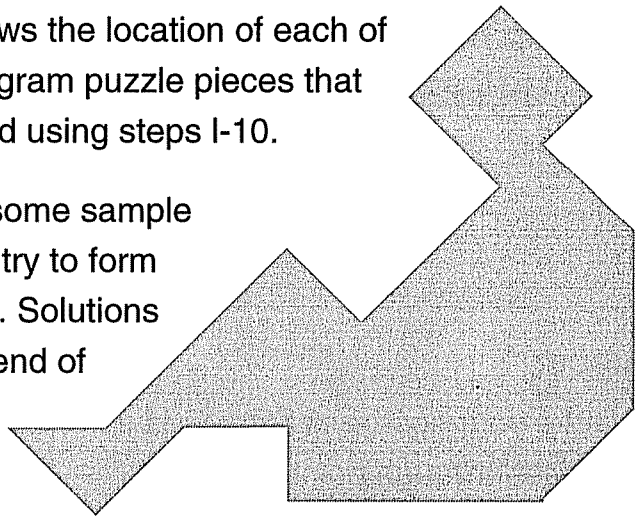


Fig B provides some sample shapes you can try to form with your pieces. Solutions are provided at end of editorial notes. "Person Reclining" is a challenger.

Fig B

