

NAME: _____



NUMERACY GAMES WITH DICE AND CARDS

A South African Numeracy Chair initiative



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GAMES IN THE CLASSROOM

Benefits

There are numerous benefits to learning through games. These include:

- Creating **meaningful situations** for the application of mathematical skills
- **Motivation** – most children enjoy playing games
- **Positive attitude** - Games provide opportunities for developing positive attitudes towards mathematics by reducing the fear of failure and error
- **Increased learning** - in comparison to more formal activities, greater learning can occur through games as a result of the increased interaction between children and provide opportunities to test intuitive ideas and problem solving strategies
- **Different levels** - Games can allow children to operate at different levels of thinking and to learn from each other. In a group of children playing a game, one child might be encountering a concept for the first time, another may be developing his/her understanding of the concept, a third consolidating previously learned concepts
- **On-going assessment** - children's thinking often becomes apparent through the actions and decisions they make during a game, so the teacher has the opportunity to carry out diagnosis and assessment of learning in a non-threatening situation
- **Home and school** - Games provide 'hands-on' interactive tasks for both school and home
- **Independence** - Children can work independently of the teacher. The rules of the game and the children's motivation usually keep them on task.

Mathematical games are 'activities' which:

- involve a challenge
- are governed by a set of rules and have a clear underlying structure
- normally have a distinct finishing point
- have specific mathematical cognitive objectives

Source: <http://nrich.maths.org>

More benefits

Games taught and used in the classroom can potentially also be played at home and shared with family members, thereby allowing:

- learners to spend more time on maths
- learners to consolidate skills and practice what they have learnt in class
- learners to teach other people the rules
- other people to get involved in mathematics



Competition vs. Collaboration

Games can encourage *collaboration*, *communication* and *competition*. However, too much emphasis on competition can be counter productive as the game becomes about the winning or losing and not the mathematics or the strategies. Emphasise collaboration and communication more often than competition.

Introducing games into the classroom

In teaching games to large groups Gillian Hatch has found three different methods that work well.

1. Introduce the game to one group of learners while the others are completing some individual work.
2. Then divide the whole class into groups. Put one learner from the initial group into each group to teach the game to the group. Divide the class into the groups in which they will subsequently play. Play the game with the whole class, with each group acting as a single player.
3. Choose a set of learners to come to the front of the class and play the game as a demonstration, possibly with assistance in decision making from the whole class.

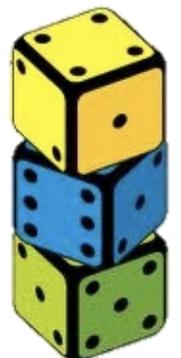
Source: <http://nrich.maths.org/2928/index>

Hints for Successful Classroom Games

- Make sure the game matches your mathematical objective(s)
- Use games for specific purposes, not just time-fillers
- Keep the number of players from 2 to 4, so that turns come around quickly
- The game should have enough of an element of chance so that it allows weaker students to feel that they a chance of winning
- Keep the game completion time short

Source: <http://nrich.maths.org>

NOTES



This booklet

The following pages give many examples of both card and dice games. Most are relatively easy to set up and teach and do not involve too much preparation.

Any of the games in this booklet can be differentiated by changing a rule or two, using multiplication instead of addition, or by simply requiring learners to prove their work to their partner through talking or writing.

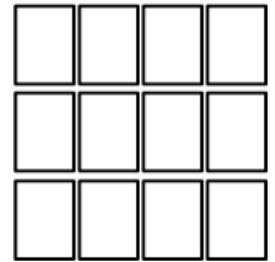
Use the spaces provided to note your own variations, ideas and those that the learners may come up with. Make the booklet your own.

PLAYING CARD GAMES FOR BONDS

TEN!

You need: 1 set of playing cards without Jokers or picture cards.
Play on your own or with a friend.

- Place 12 cards **face up** in a 3 rows of 4
- Take turns choosing a set of cards which add to 10.
- Fill in the spaces with new cards
- Play continues until no more sets of ten can be formed. The winner is the player who finishes with the most cards.
- When a player plays alone, the object of the game is to find the maximum number of cards that have a sum of ten.



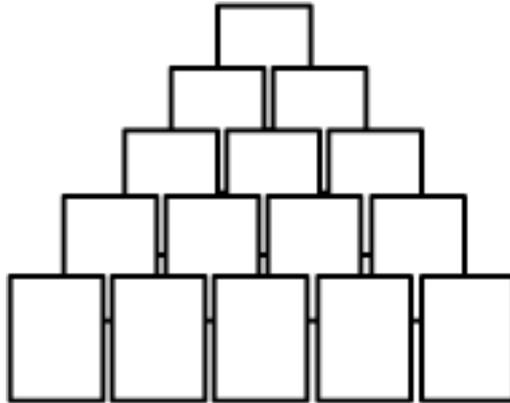
SPACE FOR YOUR OWN AND LEARNER IDEAS



PYRAMID GAME

You need: 1 pack of cards

- All picture cards = 10, Ace = 1
- The aim of the game is to remove as many cards from the pyramid as possible. Only cards that are “free” (not covered by other cards) may be used.
- Layout 15 cards **face up**, into the shape of a pyramid, as shown



- Keep the rest of the pack **face up** on the table
- Look for pairs of cards in the pyramid or on the top of the pile that make 10. Remove these from the pyramid or the pile and put to one side.
- Keep looking for free cards that make 10. If you cannot find any in the pyramid, turn over 1 card from the pack. The pack can be used with cards from the pyramid to add to 10.

Pyramid Game Bond Variations:

- Bonds to 11: Find pairs that add to 11.
- Bonds to 12: find pairs that add to 12.
- Bonds to 13: King = 13, Queen = 12, Jack = 11, Ace = 1. Find all pairs that add to 13.

Adapted from <http://www.education.com/activity/article/secrets-of-the-great-pyramid/> & personal experience



HORSE SHOE

Skill: fluency in basic number facts.

You need: 1 pack of cards

Work with: a partner, a small group or in 2 teams

- All picture cards = 10, Ace = 1
- Spread all the cards out in a horseshoe shape, **face down**
- Take turns to turn over one random card and lay it in the middle of the shape
- As a new card is laid down find pairs / sets of cards that add to 10
- Take the cards that add to 10 from the middle of the shape
- Next learner takes a turn

In the clubs we have refined this to say that a when selecting a card, they can keep it in their hand to see if it makes 10. Once the card is put down in the shape, then any learner can claim the cards that make 10.

VARIATIONS: Add to 20, 30 etc.

NUMBER MEMORY

Skills: Number recognition, number sense, spatial memory

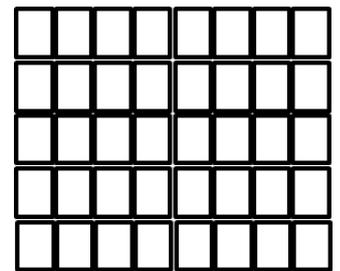
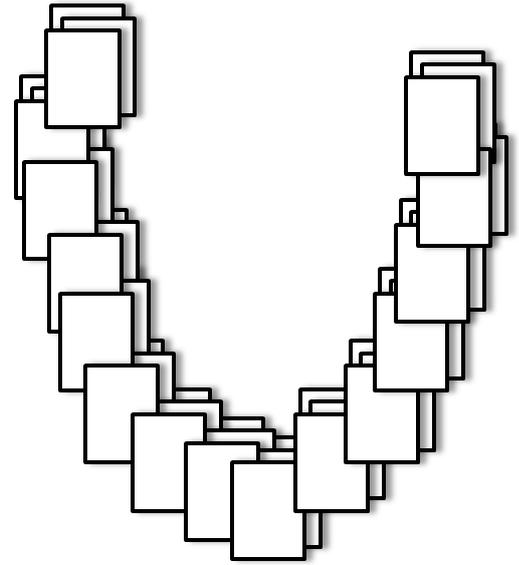
You need: 1 pack of cards WITHOUT picture cards and jokers (40 cards)

Work with: a partner, a small group or in 2 teams

- Arrange the cards **face down** in 5 rows of 8
- Players take turns turning over a pair of cards. If the numbers match, the player wins the two cards and takes another turn.
- If the cards do not match, they're flipped **face down** and the next player has a turn.
- Play continues until all number matches are found.

VARIATIONS:

- Smaller layouts for younger learners
- Match cards that add to 10, 12, 13 and so on
- Match numbers that are either both odd or both even

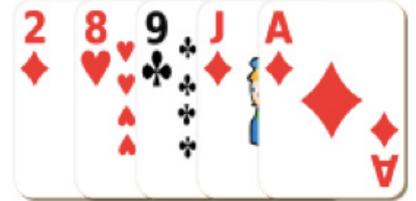


OTHER PLAYING CARD GAMES

ADD 5 CARDS

Skill: 1 & 2 digit addition and addition strategies

- Work in pairs using *Think, Pair, Share* (see insert box below)
- King = 13, Queen = 12, Jack = 11, Ace = 1
- Deal out 5 cards **face up** as shown
- Both learners add up the values of the cards
- Check each other's totals and discuss the strategies used to add



VARIATIONS: use less cards for younger learners or take out picture cards

Adapted from: <http://www.math-drills.com/addition.shtml#Games>

THINK, PAIR, SHARE

Work through the problem on your own, then, explain your thinking to your partner

Don't forget to: Listen to each other & ask questions

YES, NO, YOU'VE GOT IT

Skills: logic, number sense

You need: 1 deck of playing cards

Work in groups, teams or pairs

- Decide who will go first
- This person draws 1 card from the deck at random and keeps it secret.
- Other players take turns asking mathematical questions to find out what card was drawn. The person with the card responds to each question with one of these choices: "**Yes**," "**No**," or "**You Got It!**"
- E.g. dealer chooses a 4 of diamonds. Questions might go like this:
 - Is the card black? (No)*
 - Is the value of the card greater than 6? (No)*
 - Is the card greater than 3? (Yes)*
 - Is the card a five? (No)*
 - Is the card a six? (No)*
 - Is the card a heart? (No)*
 - Is the card a four of diamonds? (You Got It!)*
- The player who correctly guesses a card earns that card and takes the next turn.
- Play until one player has 10 cards.

Source: <http://www.education.com/activity/article/yes-no-you-got-it/>

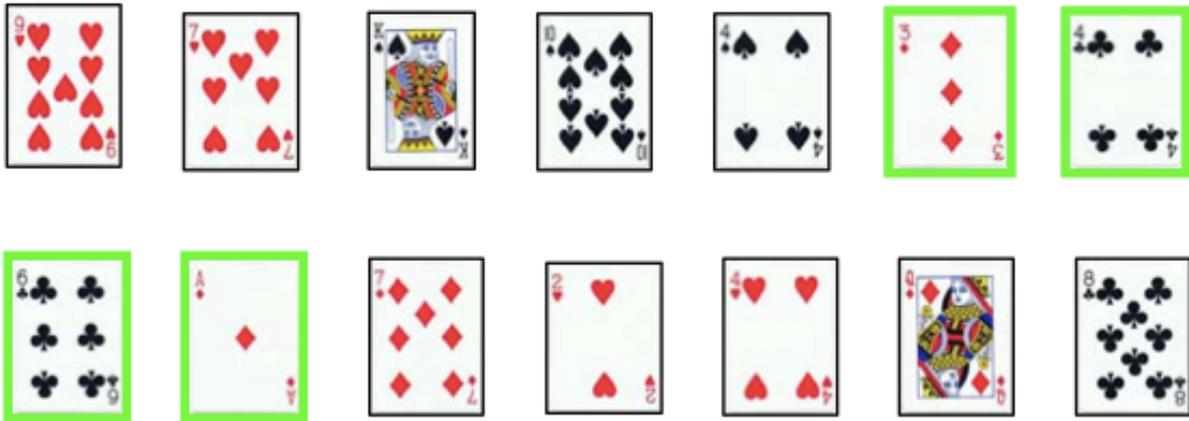
I SPY SUMS

Skill: Addition, fluency & efficiency

Players: 2 or more

You need: 1 Deck of cards, Ace = 11, Jack = 12, Queen = 13, King = 14, scrap paper

- Deal out the entire deck of cards **face up** in 5 rows of 4.
- One player challenges the other player (or player to his/her right) to find two cards next to each other, either vertically, horizontally or diagonally, that add to make a number by saying, "I spy two cards that add to 7."
- The challenged player then looks for two cards that add to that number and picks up this pair. In this example: 3 of diamonds & 4 of clubs or 6 of clubs and Ace of diamonds



- If the second player misses any pair(s) that add to the chosen sum, then the first player may claim them. Players swap roles and continue until the table is cleared. The winner is the player with the most cards at the end of the game.
- Fill gaps as they appear.

VARIATION:

Multiply 2 cards instead of adding by saying, "I spy two cards with a product of 40."

Source: *Acing Math (One Deck At A Time!): A Collection of Math Games*
<http://www.pedagonet.com/quickies/acingmaths.pdf>

FLIP OUT

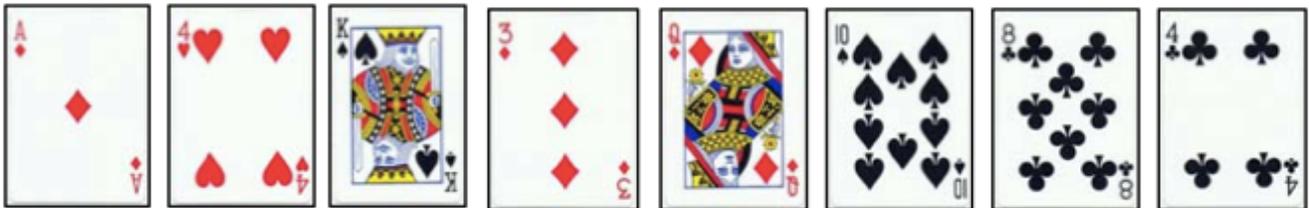
Skill: Efficient addition strategies

Players: Individual, then pairs

You need: 1 Deck of cards per learner (or half a deck per learner)

Picture cards = 10, Ace = 1, scrap paper

- Each learner shuffles his/her deck and lays it **face down** on the desk.
- The teacher calls out, "Go!" and then the learner flips over one card at a time, and calculates a running total of the values on the cards.
- After thirty seconds, one minute, or two minutes (depending on the ability of the class), the teacher says, "Stop!"
- Learners write down their total e.g. 50 for this set



$$1 + 4 = 5$$

$$5 + 10 = 15$$

$$15 + 3 = 18$$

$$18 + 10 = 28$$

$$28 + 10 = 38$$

$$38 + 8 = 46$$

$$46 + 4 = 50$$

- Players check each others totals.
- The winner is the one with the highest total. If a total is wrong, the player cannot be the winner of that round.
- Play again.

Source: *Acing Math (One Deck At A Time!): A Collection of Math Games*
<http://www.pedagonet.com/quickies/acingmaths.pdf>

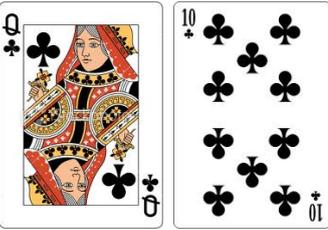
SUBTRACTION NUMBER BATTLE

Skill: Number recognition and subtraction

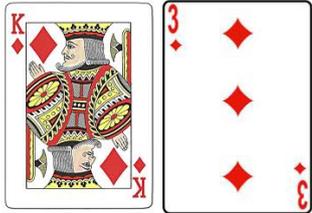
Players: pairs

You need: 1 Deck of cards, face cards = ten, Ace = 1

- Players split a deck of cards
- At the same time, each player flips over their top **two** cards and subtract the smaller number from the larger number.
- EXAMPLE:



- Player 1: Difference is 0

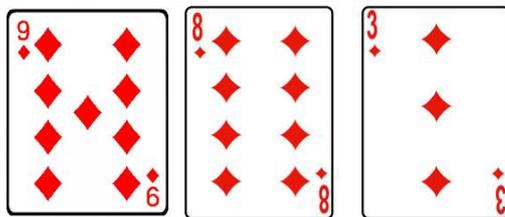


- Player 2: Difference is 7

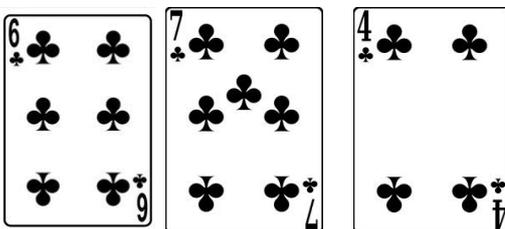
- Player 2 wins all four cards
- If the card differences have the same value, the cards are placed in a centre pile. The next round is played normally and the winner of the next subtraction number battle takes the centre pile as well.

VARIATION: place value and subtraction

- Remove the 10s, face cards and jokers from the pack
- Players split a deck of cards and simultaneously flip over their top three cards.
- Make two of them into a 2 digit number and subtract the third. Players may move the cards to place them in any position they wish.
- EXAMPLE:



- Player 1: $98 - 3 = 95$



- Player 2: $67 - 4 = 63$

SPACE FOR YOUR OWN AND LEARNER IDEAS



DICE GAMES - QUICK IDEAS

KNOCK OFF NUMBERS

You need: 1 dice, paper & pencil

- 1 learner throws 1 dice, other writes the number that is thrown.
- Do this 10 times in total.
- Learners' work together to add the numbers as quickly as possible using their own strategies.



BONDS TO 20

- Throw 1 dice many times. Keep adding each time to get to **EXACTLY** 20. If your score adds to more than 20 you are bust! Start again.

VARIATIONS:

- Add to 30, 50 or 100.



SPACE FOR YOUR OWN AND LEARNER IDEAS

MENTAL MATHS

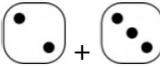
Skills: Relationship between addition and subtraction

- Each learner gets a dice
- Roll the dice and keep the number in their head
- Using that number, give them something to work out e.g. +10 to the number, add 10 more to the answer, + 100 to the answer. What's your answer now?
- Can they work out what another learner's original number was by working backwards e.g. Answer -100, less 10, -10?



HOW MANY TO 20

- Throw two dice
- Add the numbers together
- Say how many more you need to make 20

e.g.  +  answer 15

VARIATIONS:

You can use more dice and say how many to add to 25; 30; 50 or 100



PRACTICING DOUBLES

- Play with a friend
- Throw a single dice, then double the value and add 1. e.g. throw a 6. Double 6 is 12 then add 1 = 13.
- The winner is the person with the highest number.
- Play again.

VARIATIONS:

- Subtract 1 from the number and then double it e.g. throw a 5. Subtract 1 is 4, double 4 is 8
- Make up your own variations



BEAT THAT!

Skills: Place value, 2 digit addition & estimation

You need: 2 dice, scrap paper, work in pairs

- Roll the dice. Make the biggest 2 digit number possible.
For example: if you roll a 4 and a 6, your biggest number would be 64
- Write down your number under your name on paper
- Pass the dice, and challenge your partner to "Beat That!"
- Have 3 turns each
- ESTIMATE who you think will have the biggest score
- Then add up your numbers and your partner's numbers
- Check and compare your answers
- Was your estimate correct?

VARIATION: Try making the smallest number possible!

Source: http://www.activityvillage.co.uk/beat_that.htm



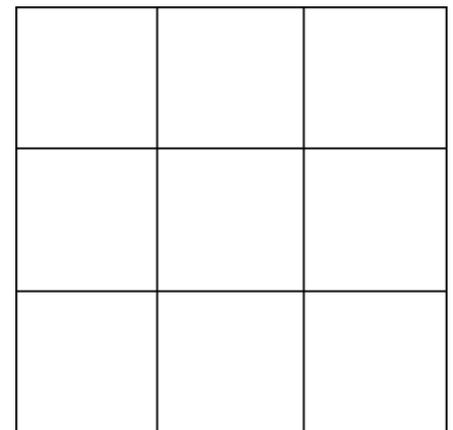
MAKE 12

Skills: Addition, subtraction and addition strategies

You need: 1 dice, scrap paper, a pencil. Work in pairs

The aim of this game is to add numbers to make a total of 12 in each box. You need to get three boxes in a line (up, down, diagonal) to end the game

- Draw a 3 x 3 grid like this on scrap paper
- Take turns to throw the dice and write that number in one of the boxes on the grid.
- When it is your turn, keep adding numbers to a box until it adds to EXACTLY 12. If the number on the dice will make the numbers add to more than 12, you will need to put that number in another box
- When a box adds to 12, you can put a line through the box
- Keep going until there are three filled boxes in a row or column or diagonal. The game finishes when this happens.



VARIATIONS: Use a bigger grid or add to a bigger number such as 15, 16, 20 etc.

Adapted from: <http://nrich.maths.org/7337/index?nomenu=1>

NUMBER LINE GAME

Play with a friend.

You need: 2 matchsticks or toothpicks, 1 dice, 0-20 number line to the right

Addition Game

- Each player puts a stick on 0 at the **beginning** of the number line.
- Take turns rolling the dice. Move your stick forward along the number line by the number rolled on the dice.
- If you land on the same number as another player, the other player goes back to 0.
- The first player to land on 20 wins!
- If you go past 20, you must go back to 0

Subtraction Game

- Play as above except start by putting your sticks on 20.
- This time move your stick backwards along the number line by the number rolled on the dice.
- The first player to land on 0 wins!
- If you go past the 0, you must go back to 20.



BUILDING ARRAYS

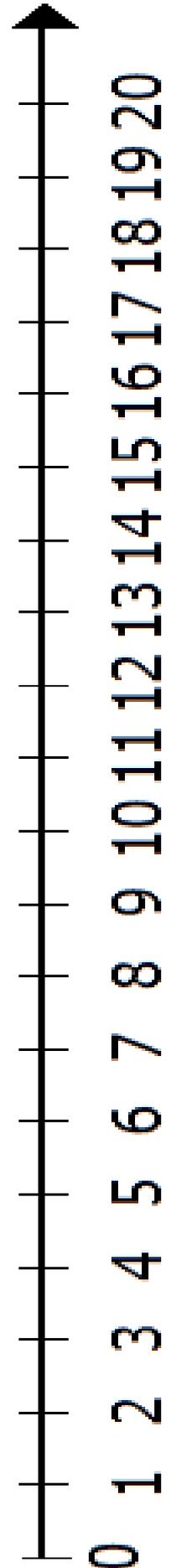
Skill: Early Multiplication

You need: 1 dice, counters and scrap paper

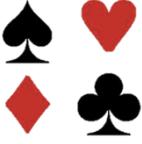
- Roll the dice twice. The first number you roll tells how many rows to make in your array. The second number you roll tells how many counters to put in each row of your array.
- **Example:** If you roll a 5 first and then a 2, you might make this
- Draw each array you make.
- Record how many rows, how many counters in each row, and how many counters in all for each array you make.



EXTENSION: each time a square array is made, let the learners colour it in red when they draw it



SPACE FOR YOUR OWN AND LEARNER IDEAS



LONGER DICE GAMES

BEETLE GAME

Basic Play

- Work in pairs with 1 dice per pair
- One person draws the beetle and the other throws the dice
- Throw the dice in order to draw the beetle. See 'Drawing the Beetle' on the next page.
- When a pair has drawn a complete beetle, they shout "Beetle" and everyone must stop playing.
- Each pair adds up the number of body parts they have drawn with the maximum being 14. Write this on a scorecard or piece of paper.
- Players swap roles and play again. Play between 4 or 6 games.
- Pairs can add up their scores using any strategies they wish.
- Pair with highest score wins.

Extension activities

- Before each pair adds up scores, the whole group can **estimate** which pair they think has the highest score and lowest score. Discuss strategies
- Then each pair adds up their score and hand to another pair to check and agree/disagree
- Check actual scores against estimates

3 Other Game Variations

1. *Practice doubling:* Score as above but double the scores at the end
2. *Practice counting in multiples and using other adding strategies:* Instead of getting 1 point per body part, use the actual values of each body part as the score. This is much harder but gets the learners thinking. The maximum score will then be 43

e.g.

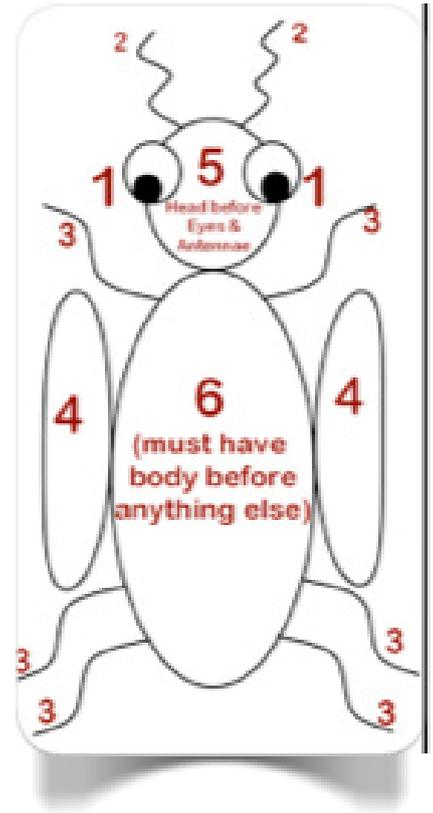
Body	Head	Eyes	Feelers	Legs	Wings
6	5	2 x 1	2 x 2	6 x 3	4 x 2

3. *Draw crazy creatures:* Throw the dice 12 times and draw the creature that you get. Add up the values of the body parts drawn. See example to the right: I threw: three 6s, four 3s, one 5, two 2s and two 1s, to get a score of 41.

DRAWING THE BEETLE

There are 14 body parts - body, head, 2 wings, 6 legs, 2 feelers, 2 eyes

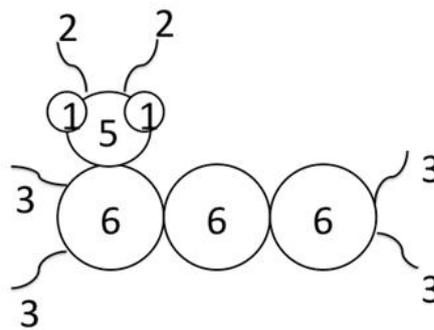
- you must throw a 6 to start - and you can then draw the **BODY**
- throw a 5 - draw the **HEAD** - must be drawn before eyes & feelers
- throw a 4 - draw the **WING** (2 of these)
- throw a 3 - draw a **LEG** (6 of these)
- throw a 2 - draw a **FEELER** (2 of these). Must have the head first
- throw a 1 - draw an **EYE** (2 of these) Must have the head first



Sourced and adapted from: http://www.charnwood-catalogue.co.uk/fundraising.php?info_id=138

SANC Maths Clubs Beetle Game			
			
The round ends when the first pair in the room draws a complete beetle and shouts "BEETLE" The pair adds up their score. 1 point for each part of the beetle drawn. Total of 14 body parts. For Variations, see SANC Games Booklet			
1	2	3	1
SCORE	SCORE	SCORE	2
4	5	6	3
SCORE	SCORE	SCORE	4
SCORE	SCORE	SCORE	5
SCORE	SCORE	SCORE	6
Name	Total Score		

Sample Score Card



Draw Crazy Creatures

$$\begin{array}{r}
 5 + 6 \times 3 + 3 \times 4 + 1 \times 2 + 2 \times 2 \\
 5 + 18 + 12 + 2 + 4 = 41
 \end{array}$$

Sources of games

This booklet has been compiled using ideas from:

- <http://nrich.maths.org>
- www.pedagonet.com
- www.education.com
- http://www.charnwood-catalogue.co.uk/fundraising.php?info_id=138
- Games used in SANC Maths Clubs



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