

LESSON CARD

Magic Dice

An activity suitable for Australian years 2–6

Learning areas: Number and place value, patterns and algebra, linear and non-linear relationships, data representation and interpretation.

Resources: Lots of regular six-sided dice (plus 8-, 10-, 12- or 20-sided dice for later challenges). Visit www.amt.edu.au/resources-for-the-classroom for links to the applicable Australian Curriculum content descriptors and additional resources for this activity, including nets to create your own dice from paper or card, plus a summary table to help with Challenge (b).

Magic Dice

In this activity you will learn a trick to amaze your family and friends!

Take three dice and stack them on your desk as shown. If you look from different angles, the following numbers are visible:

top layer: 1, 3, 5, 2 and 4

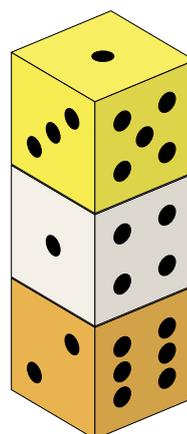
middle layer: 1, 4, 6 and 3

bottom layer: 2, 6, 5 and 1

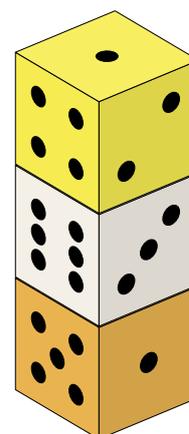
So the hidden numbers are 6, 2, 5, 3 and 4.

Adding these up, we see that the *hidden total* is 20.

Tip: When adding up the hidden total, start from the top and work down: '6 plus 2 equals 8, plus 5 equals 13, plus 3 equals 16, plus 4 equals 20.'



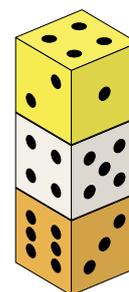
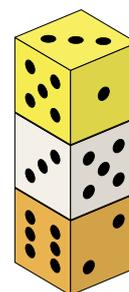
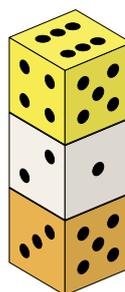
front view



back view

Challenges

- (a) Create the three different stacks shown here. What is the hidden total for each one?



(b) Draw up a table to summarise your results so far, for example:

top face	visible side faces			hidden faces	hidden total
1	3,5,2,4	1,4,6,3	2,6,5,1	6,2,5,3,4	20
6	4,5,...	2,1,...			
3	5,1,...				
⋮	⋮	⋮	⋮	⋮	⋮

(c) Make your own stacks with three dice and add the results to the table. What do you notice? There is a quick way to work out the total without knowing all of the faces.

(d) Ask a classmate to build a stack of three dice. Quickly look at the stack and then announce the hidden total. Practice makes perfect!

(e) How is the trick affected when you use a different number of dice? Come up with your own rule and practise the trick with your classmates.

(f) Create a stack of dice where the hidden total is 31. How many dice do you need to use and what is the value of the top face?

(g) Ask a classmate to secretly build a stack of any height and get them to tell you the hidden total. Without looking, tell them the number of dice and the value of the top face. As always, practice makes perfect!

(h) Find out what happens when you use the following types of dice instead:

- 8-sided ([octahedron](#))
- 10-sided ([pentagonal trapezohedron](#))
- 12-sided ([dodecahedron](#))
- 20-sided ([icosahedron](#))

[Note: the answer to this may depend on how the manufacturers have designed the particular dice you are using.]

(i) There is one other common type of dice which is missing from the list above. Which is it and why?