

LETBERS

“a game for two or more players”

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Numeracy (10) – Differentiation X

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You need:

1 Letbers board, 2 dice, 3 counters for 3 players (more for more)

You may need:

pencil and paper, chalk and board, etc.

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How to Play

Setting Up For The Game

- S1. The object of the game is to see who can score the most points.
- S2. Before starting the game, players agree to how long the game is played; for example: 30 minutes.
- S3. All players take a turn throwing the dice, and the player with the highest number starts the game. Turns are taken in a clockwise direction.
- S4. The players place their counters to the left of the letter ‘l t’ on the Letbers board.

Playing The Game

- P1. The first player takes their turn by throwing the dice. The number is noted.
- P2. The player moves their counter by the same number of spaces.
- P3. The player answers a question according to the game they are playing. If they get the question correct, they get points (number thrown on dice) which are added to their total score. If they do not get the question correct, they get no points – but their counter stays at the new position.
- P4. The next player takes their turn (i.e. the player sitting next to them, in a clockwise direction)... And so on.

Game 1 – Do the Indices

There are a number of games possible. One is in which the player throws the dice, and the sum of the numbers obtained becomes the index. The function then has to be differentiated.

For example, if the player throws 6 and 1, the answer would be:

$$(i) \ y = x^{6+1} = x^7 \Rightarrow \frac{dy}{dx} = 7x^6$$

Another game in which the the numbers are subtracted (large minus small, or small minus large) to give the index. So, if the player were to throw 4 and 2, we would get:

$$(ii) \ y = x^{4-2} = x^2 \Rightarrow \frac{dy}{dx} = 2x$$

$$(iii) \ y = x^{2-4} = x^{-2} \Rightarrow \frac{dy}{dx} = -2x^{-3}$$

An extension of this would be a negative index, as the following game shows:

$$(iv) \ y = x^{-(6+1)} = x^{-7} \Rightarrow \frac{dy}{dx} = -7x^{-8}$$

Game 2 – Times X

One number is used as the product and the other as the index.

If the player were to throw 1 and 2, we would get:

$$(i) \ y = 1x^2 \Rightarrow \frac{dy}{dx} = 2x$$

$$(ii) \ \text{or, } y = 2x^1 \Rightarrow \frac{dy}{dx} = 2$$

Game 3 – Adder

For example, when the player throws 3 and 1, we get:

$$y = x^3 + x^1 \Rightarrow \frac{dy}{dx} = 3x^2 + 1$$

Game 4 – Times are Changing

In this game, the numbers on the dice are multiplied to give the index. This can also be used to get a negative index.

So, if the player throws 6 and 6, we can get:

$$(i) y = x^{6 \times 6} = x^{36} \Rightarrow \frac{dy}{dx} = 36x^{35}$$

$$(ii) y = x^{-6 \times 6} = x^{-36} \Rightarrow \frac{dy}{dx} = -36x^{-37}$$

Game 5 – Fractional Distillation

The numbers on the dice are used to make a (positive or negative) fraction.

So, for example, if the player throws 1 and 6, we get:

$$(i) y = x^{1/6} \Rightarrow \frac{dy}{dx} = \frac{1}{6} x^{-5/6}$$

$$(ii) y = x^{6/1} \Rightarrow \frac{dy}{dx} = 6x^5$$

$$(iii) y = x^{-1/6} \Rightarrow \frac{dy}{dx} = -\frac{1}{6} x^{-7/6}$$

$$(iv) y = x^{-6/1} \Rightarrow \frac{dy}{dx} = -6x^{-7}$$

Game 6 – Too Calculus

The player throws the dice twice to get a compound equation.

So, for example, if the player throws 4 & 6 and 6 & 2, we can get:

$$(i) y = 4x^6 + 6x^2, \text{ or } y = 4x^6 - 6x^2, \text{ or } y = 4x^6 + 2x^6, \text{ or } y = 4x^6 - 2x^6$$

$$(ii) y = 6x^4 + 6x^2, \text{ or } y = 6x^4 - 6x^2, \text{ or } y = 6x^4 + 2x^6, \text{ or } y = 6x^4 - 2x^6$$

$$(iii) y = x^{4/6} + x^{2/6}, \text{ or } y = x^{4/6} - x^{2/6}, \text{ or } y = x^{4/6} + x^{6/2}, \text{ or } y = x^{4/6} - x^{2/6}$$

$$(iv) y = x^{6/4} + x^{2/6}, \text{ or } y = x^{6/4} - x^{2/6}, \text{ or } y = x^{6/4} + x^{6/2}, \text{ or } y = x^{6/4} - x^{2/6}$$

$$(v) \text{ Also, combinations: } y = 4x^6 + x^{2/6}, \text{ or } y = 4x^6 - x^{2/6}$$