

Grades 8 (A), 9-12 (AS)

Duration: 30-45 min

Tools: one 16 pcs Set / group

Pair / Group work

Keywords: Faces, Favourable outcome, Total outcome

617 - Can you Match Them?



MATHS / PROBABILITY



LOGIFACES
METHODOLOGY
Erasmus+

TEACHER
Logifaces

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DESCRIPTION

Students fix one block, e.g. the block 223 and choose one other block from the 16 pcs Set at random and find the probability that the chosen block

- a) can be fit to the block 223 by the top face
- b) can be fit to the block 223 by at least one vertical face
- c) can be fit to the block 223 by at least one face
- d) can be fit to two or more faces of the block 223
- e) cannot be fit to the block 223

Fitting the base faces is not permitted, as all base faces are congruent equilateral triangles. Fitting by a face means that the whole face fits together.

The above questions have the following difficulty levels:

LEVEL 1 part a)

LEVEL 2 part b) and e)

LEVEL 3 part c) and d)

Fixing other blocks instead of the block 223 gives different difficulty levels, as follows:

LEVEL 1 blocks 111, 333

LEVEL 2 blocks 113, 133

LEVEL 3 blocks 112, 122, 223, 233, 123, 132

SOLUTIONS / EXAMPLES

The traditional model of probability is used in the solution, because all elementary events are equally likely. Hence the probability of an event is calculated using the formula

$$Pr(event) = \frac{\text{number of favourable outcomes}}{\text{total number outcomes}}.$$

Total number of outcomes is 15 for every question.

Note that the orientation of the faces matters. For example, the vertical faces 12 and 21 are reflections of each other. The block 123 has a vertical face 12 but does not have a vertical face 21

The numbers of favourable outcomes are listed in the table below. For more details and hints see the solution of exercise [621 - Fitting Faces](#).

Level	1	3	3	2	2	3	3	3	3	1
fix block	111	112(2)	122	113	133	223(2)	233(3)	123(2)	132(2)	333
a) blocks	333	112(1), 122, 223(2), 233(3)	112(2), 223(2), 233(3)	133	113	112(2), 122, 223(1), 233(3)	112(2), 122, 223(2), 233(2)	123(1), 132(2)	123(2), 132(1)	111
a) fav.o.	1	7	7	1	1	7	7	3	3	1
b) blocks	112(2), 113	111, 112(1), 122, 113, 123(2), 132(2)	112(2), 223(2), 123(2), 132(2)	111, 112(2), 133, 123(2), 132(2)	113, 123(2), 132(2), 233(3), 333	122, 223(1), 233(3), 123(2), 132(2)	223(2), 233(2), 133, 123(2), 132(2), 333	112(2), 122, 113, 133, 223(2), 233(3), 132(2)	112(2), 122, 113, 133, 223(2), 233(3), 123(2)	133, 233(3)
b) fav.o.	3	8	8	8	9	9	10	12	12	4
c) blocks	112(2), 113, 333	111, 112(1), 122, 113, 123(2), 132(2), 223(2), 233(3)	112(2), 223(2), 123(2), 132(2), 233(3)	111, 112(2), 133, 123(2), 132(2)	113, 123(2), 132(2), 233(3), 333	112(2), 122, 223(1), 233(3), 123(2), 132(2)	112(2), 122, 223(2), 233(2), 133, 123(2), 132(2), 333	112(2), 122, 113, 133, 223(2), 233(3), 123(1), 132(2)	112(2), 122, 113, 133, 223(2), 233(3), 123(2), 132(1)	133, 233(3), 111
c) fav.o.	4	13	11	8	9	11	13	13	13	5
d) blocks	112(2), 113	112(1), 122	112(2), 223(2)	133	113	122, 223(1), 233(3)	223(2), 233(2)	132(2)	123(2)	113, 233(3)
d) fav.o.	3	2	4	1	1	5	4	2	2	4
e) blocks	122, 133, 223(2), 233(3), 123(2), 132(2)	133, 333	111, 113, 133	122, 223(2), 233(3), 333	111, 112(2), 122, 223(2)	111, 113, 133, 333	111, 113	111, 333	111, 333	112(2), 122, 113, 223(2), 123(2), 132(2)
e) fav.o.	11	2	3	7	6	4	2	2	2	10

The notation fav.o. stands for the number of favourable outcomes. The notation ABC(D) is used for repeated block types, where D notes the number of blocks ABC that can be considered as favourable outcomes. The probabilities can be derived from this table by dividing the number of favourable outcomes by 15 (the total number of outcomes).

PRIOR KNOWLEDGE

The traditional model of probability

RECOMMENDATIONS / COMMENTS

This exercise is suitable for differentiation and group work. Different blocks and questions can be given to students with different levels of knowledge and they can be encouraged to discuss their results.

Exercise [621 - Fitting Faces](#) consists of more general questions of this type and an overview to answer the questions with fewer calculations.

Exercise [622 - Addition Rule of Probability](#) is recommended after this exercise where students will encounter the addition rule of probability.

