

COLLISIONS

One way objects can transfer energy is by bonking into each other.

For example, in a game of pool, a ball that was moving can suddenly stop, and a ball that was just sitting there can suddenly start moving after being struck.

Energy can transfer from one ball to another.



- 13 In a game of pool, the yellow 1-ball is rolling towards the black 8-ball, which is resting on the table. Which ball has more energy? Check one.



- ☐ The 1 ball
- ☐ The 8 ball
- ☐ They're equal

- 14 When the 1-ball strikes the 8-ball, the 1-ball stops, but the 8-ball rolls away at about the same speed and direction that the 1-ball was moving. Which ball has more energy now? Check one.



- ☐ The 1 ball
- ☐ The 8 ball
- ☐ They're equal

- 15 In a collision where the 1-ball stops and the 8-ball moves the same speed and direction that the 1-ball was moving, how would you describe the way energy changes in the balls during the collision? Check one.

- ☐ Both balls gain energy
- ☐ Both balls lose energy
- ☐ The 1-ball loses energy and the 8-ball gains energy

When objects collide, energy is transferred between them. In pool, the ball that is struck gets its energy from the ball that hits it. The more energy a ball has, the farther it can go.

In real collisions, not all of the energy transfers from one ball to another, but with the right equipment and procedures, scientists can create collisions where nearly all of the energy is transferred from one object to another.

- 16 The 1-ball hits the 8-ball, which is at rest on a pool table. Do you think it is possible for the 8-ball to go faster than the 1-ball was going? Explain.



- 17 What will happen if the 1-ball strikes the 8-ball below? Try something similar with checkers or coins. Flick the checker on the left into the two that are touching on the right to see what happens. Try it a few times and describe your results below.



What's That Toy?

You may have seen a desk toy like this called a Newton's Cradle. It is an excellent demonstration of how energy can be transferred between objects. When one ball strikes the rest, how many of

the other balls do you think will move? Find videos of Newton's Cradle to see the various ways that energy can be transferred between swinging balls in this mesmerizing science toy.



RICOCHET PUZZLES

Most collisions are not perfectly head-on. If a pool ball ricochets (rick-oh-shays) off of another pool ball, it will only transfer some of its energy. In a Ricochet Puzzle, balls strike each other and give away some or all of their energy units. The more energy a ball has, the farther it can go. A ball can travel 1 unit for every energy unit it has. The energy given to the first ball is shown below the pool cue in each puzzle. The energy a ball uses is given by the dots on its path.

There are only two ways one ball can strike another in a Ricochet Puzzle:

HEAD-ON

A ball gives all of its remaining energy to any ball it hits head-on.

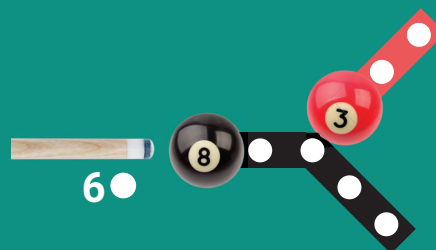


In this example, the 8-ball starts with 5 energy units (5●).

It uses 2, then hits the 3-ball head-on. It gives its remaining 3 energy units to the red 3-ball which travels 3 units and stops. Notice there are a total of 5 energy units (5●) used.

RICOCHET

A ball gives half of its remaining energy to the ball it ricochets off of.



In this example, the 8-ball starts with 6 energy units (6●).

It uses 2, then ricochets off the 3-ball. Since the 8-ball has 4 energy units left, it gives 2 units and keeps 2 units. So, both balls travel 2 units after the ricochet. There are a total of 6 energy units (6●) used.

PRACTICE:

Use the diagrams to answer the questions below.

- 18 How many units will the 1-ball travel before it stops?



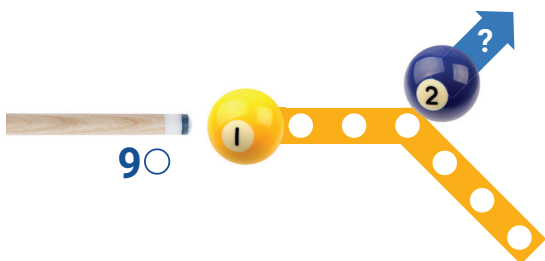
- 19 How many energy units were given to the 5-ball?



PRACTICE:

Use the diagrams to answer the questions below.

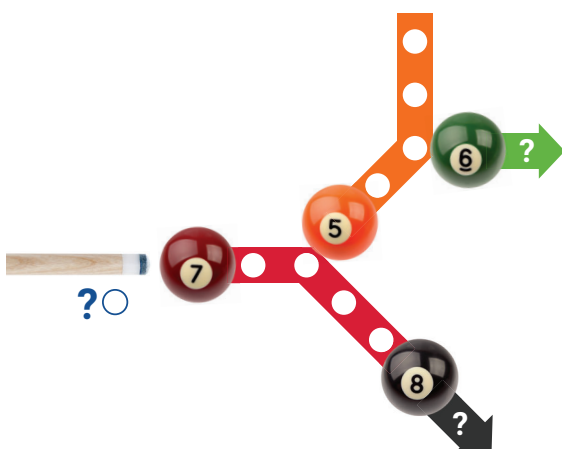
- 20 How many units will the 2-ball travel before it stops?



- 21 How many energy units were given to the 3-ball?



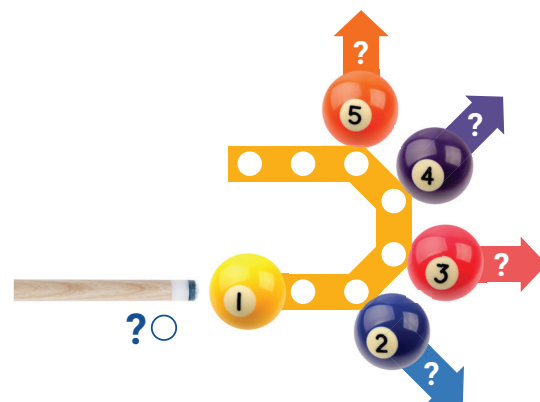
- 22 How many units will the 6-ball travel before it stops?



- How many units will the 8-ball travel before it stops?

- 23 How many units does each ball travel?

5-ball	4-ball	3-ball	2-ball



Is Pool This Simple?

Real-world ricochets are much harder to predict than this. They involve lots of different angles and spin.

In general, the more head-on a collision is, the more energy transfers. If a ball barely brushes by another

ball, it will barely give away any energy at all. This puzzle shows the basics of how energy transfer works.

(Also, you never hit the numbered balls with your cue, you hit the cue ball!)