

Worksheet: Gears and Speed

Name: _____

Date: _____

1. Bevel Gears:
 - a. Have teeth parallel to each other.
 - b. Change the direction of motion by 90° .
 - c. Change the direction of motion by 45° .
 - d. Change the direction of motion by 180° .

2. When a large gear turns a smaller gear
 - a. The RPM of the smaller gear is faster than the large gear.
 - b. The RPM of the smaller gear is slower than the large gear.
 - c. The RPM of both gears is the same.

3. When more than one set of gears are used together, they are called:
 - a. A complex gear train.
 - b. A bevel gear train.
 - c. A compound gear train.
 - d. A one-way gear train.

4. When more than one set of gears are used together, the gear ratio for the entire train is computed by:
 - a. Multiplying the gear ratios of each set together
 - b. Dividing the gear ratio of the first set by the gear ratio of the last set.
 - c. Dividing the gear ratio of the last set by the gear ratio of the first set.
 - d. Adding the gear ratios of each set together

5. To increase the speed of a robot:
 - a. Increase the gear ratio on the motor output
 - b. Increase the gear ratio on the motor input
 - c. Decrease the gear ratio on the motor output
 - d. Decrease the gear ratio on the motor input.

6. Idler gears:
 - a. Can affect the total gear ratio.
 - b. Can affect the rotational direction of the output gear.

- c. Can affect the total power available at the output gear.
 - d. Can affect the rotational speed at the output gear
7. A worm gear is special because:
- a. It turns rotational motion into straight-line motion
 - b. The direction of motion is not changed.
 - c. It can only be located on the input axle.
 - d. They provide a very small gear ratio
8. The gear set that changes rotational motion into straight line motion is called:
- a. Worm gear set
 - b. Bevel gear set
 - c. Spur gear set
 - d. Rack and pinion gear set
9. Besides gears, another item than can effect the speed of the robot is:
- a. The axle length.
 - b. The direction of the motor.
 - c. The number of sensors.
 - d. The diameter of the drive wheels.
10. Where the teeth of a gear set, composed of different sized gears, mesh:
- a. The rotational speed is the same
 - b. The linear speed is the same
 - c. The rotational speed of the smaller gear is slower
 - d. The direction of rotation is the same

Solutions: Gears and Speed

1. b. Bevel gears change the direction of motion by 90° . Spur gears have teeth parallel to each other and change the direction of rotation by 180° .
2. a. The RPM of the smaller gear is faster than the large gear.
3. b. When more than one set of gears are used together, they are called a Compound Gear Train.
4. a. The gear ratios for each individual gear pair are multiplied together to compute the overall compound gear ratio for the gear train.
5. c. The gear ratio is the ration of the number of teeth on the output gear divided by the number of teeth on the input gear. Decreasing the gear ratio decreases the number of teeth on the output gear causing it to turn faster and thus making the robot move faster
6. c. Idler gears can only effect the rotational direction of the output gear. Because they have no effect on the total gear ratio, they will have no effect on either the total power available at the output gear or the rotational speed at the output gear.
7. c. The worm gear can only be located on the input axle. A worm gear can turn a spur gear but a spur gear cannot turn a worm gear. A worm gear has a very high gear ratio because every time the worm gear makes one rotation, it advances just one tooth on the spur gear that is meshed with it.
8. d. The rack and pinion gear turns rotational motion into linear or straight-line motion. The rack can be thought of as a spur gear that has been straightened out.
9. d. Besides gears, another item that can affect the speed of the robot is the diameter of the drive wheels. The rotational speed, in RPM, is fixed by the gear ratio of the gear set. Changing the diameter of the wheel changes its circumference and thus the distance it travels in each revolution.

10.
 - b. Where the teeth of a gear set mesh, the linear speed is the same. If it weren't, then there would be slippage at that point, something that never happens in gears.