Name: _____ Date: _____ Period: _____

Activity 1.1.5 Gears, Pulley Drives, and Sprockets Practice Problems

Procedure

Answer the following questions regarding gear, pulley, and sprocket systems. Each question requires proper illustration and annotation including labeling of forces, distances, direction, and unknown values. Illustrations should consist of basic top view assembly sketches rather than realistic pictorials. Be sure to document all solution steps and proper units. Remember: counted teeth have infinite digits, and assume all other measurements contain three (3) significant digits.

All problem calculations should assume ideal conditions and no friction loss.

Gears

A simple gear train is composed of three gears. Gear A is the driver and has 8 teeth, gear B has 24 teeth, and gear C has 16 teeth.

1. Sketch and annotate the gear train described above.

2. If the output is at C, what is the gear ratio?

Formula	Substitute / Solve	Final Answer

3. If gear A rotates at 60 rpm, how fast is gear C rotating?

Formula	Substitute / Solve	Final Answer

4. If the output of torque at gear C is 150 ft·lb, what is the input torque at gear A?

Formula	Substitute / Solve	Final Answer

A compound gear train is composed of four gears, A, B, C, and D. Gear A has 10 teeth and is meshed with gear B. Gear B has 20 teeth and shares a shaft with gear C, which has 16 teeth. Gear C is meshed with gear D, the output gear. Power is supplied at gear A with 100 ft·lb of torque and is traveling at1600 rpm.

5. Sketch and annotate the gear train described above.

6. The necessary torque output for the system is 500 ft·lb. What should the gear ratio of the system be?

Formula	Substitute / Solve	Final Answer

7. With a system torque output of 500 ft·lb, how many teeth should gear D have?

Formula	Substitute / Solve	Final Answer

Pulleys and Belts

In a pulley system, pulley A is moving at 1500 rpm and has a diameter of 15 in. Three pulleys, B, C, and D, all of different sizes, are attached to a single output axle. Speed and torque output are changed within the system by moving the drive belt between pulleys B, C, and D.

8. Sketch and annotate the drive train described above.

9. A speed of 1750 rpm is required when the drive belt is connected to pulley B. What is the diameter of pulley B?

Formula	Substitute / Solve	Final Answer

10. A speed of 2000 rpm is required when the drive belt is connected to pulley C. What is the diameter of pulley C?

Formula	Substitute / Solve	Final Answer

11. A speed of 3250 rpm is required when the drive belt is connected to pulley D. What is the diameter of pulley D?

Formula	Substitute / Solve	Final Answer

Sprockets and Chains

An industrial overhead door has a chain and sprocket system designed to reduce the force needed by an operator to open and close the door. The system consists of two individual systems that are connected through a live axle shaft. To operate the door, the operator pulls a continuous loop of chain over a fixed 22 tooth sprocket that is attached to a live axle shaft (system 1). A second 22 tooth sprocket is attached to the live axle shaft and uses a chain connected to a 48 tooth sprocket that is attached to a drum that drives the door.

12. Sketch and annotate the drive train described above.

13. What is the overall system gear ratio?

Formula	Substitute / Solve	Final Answer