Предмет	Физика
Учитель	Измаилов Данияр Муратпекович
Школа, класс	г. Астана, школа-лицей «NURORDA», 10 класс
Тема урока	Uniform circular Motion (Finding optimum tangential speed)

Learning aims	• Learn to make a connection between theory and practice • Empower the students through providing new technical knowledge and practical skills related to Mechanics • Improve and consolidate science English vocabulary • Learn to solve complex problems that are combination of two or more different topics (in our Schumacher's problem we combine Circular motion (Kinematics) and Dynamics)

Learning objectives	• Apply Uniform Circular Motion in daily life by the solving Schumacher (F1 racer) problem after self-recorded video • Distinguish two different terms like Period and Frequency by watching an interactive presentation from Bilimland.kz source (School Subjects – Physics – Upper Secondary – Kinematics – Circular motion) • Differentiate tangential and angular speeds by watching an interactive presentation from Bilimland.kz source (School Subjects – Physics – Upper Secondary – Kinematics – Circular motion) • Review difference of two different speeds (tangential and angular) by practising on interactive presentation from Bilimland.kz source (Physics course – Mechanics – Kinematics – Angular velocity. Angular acceleration) • Identify suitable formulas to solve problems related to the topic, demonstrated by the ability to solve at least 2 or 3 workbook problems in a period of 10 minutes • Translate specific physics terminology related to Circular motion by working with hand-outs and training vocabulary with teacher

Previous learning (background)	Students already know the Uniform Circular Motion and the main concepts of Dynamics from 9th grade.

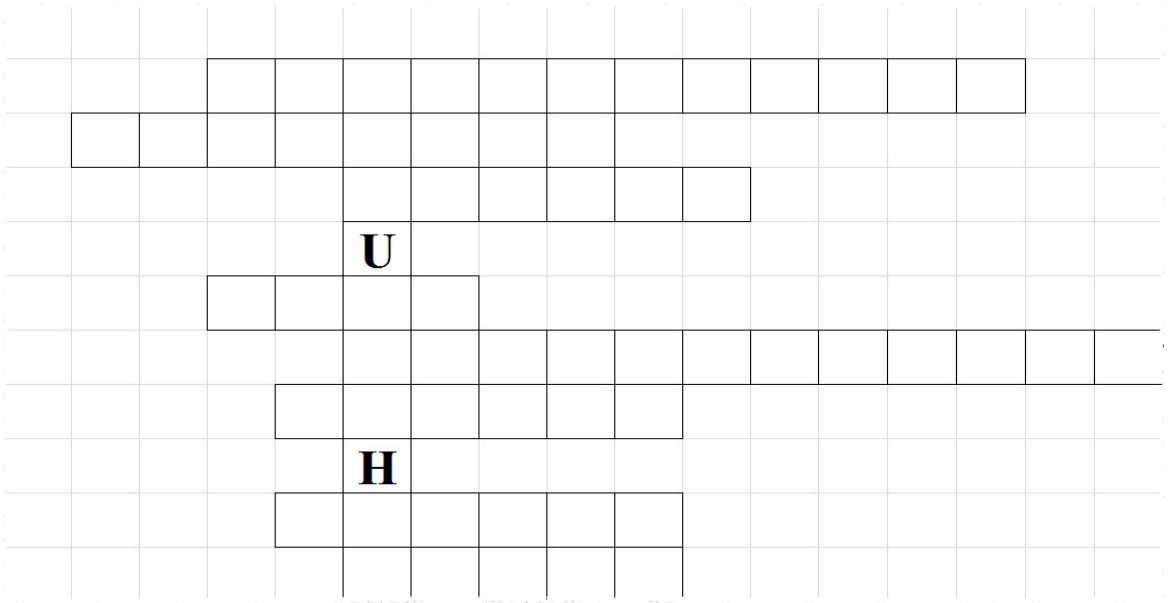
Plan

Time	Content and teacher activity	Learner activity	Formative assessment (On-going assessment)	Learning materials and resources
5	Explaining a task - revision of first two lessons (motion in one and two dimensions) and playing crossword game	Working in groups of 4. Solving **crossword** (Appendix A) Finding Key word to guess lesson topic	Observing pupils' work and results during crossword activity Q&A	Projector, Ipad, activity papers, smart board
5	Schumacher (F1 racer) video (teacher records) **Note: Schumacher is the crossword Key word. Schumacher's problem is he crashed when passing a turn; find the optimum**	Watching and guessing the name of new topic in groups	Q&A	Projector, Ipad, smart board, video - https://www.youtube.com/watch?v=NulD8sBZWA0&t=3s

Time	Content and teacher activity	Learner activity	Formative assessment (On-going assessment)	Learning materials and resources
	speed to help him			
12	Presenting interactive presentation about uniform circular motion, giving hand-outs with new **terminology** (revision of 9th grade) (Appendix B)	Watching presentation (Appendix C) and taking notes, solving examples, using hand-outs with new vocabulary	Observation, Q&A (training terminology)	Projector, smart board, PPP from Bilimland.kz (School Subjects – Physics – Upper Secondary – Kinematics – Circular motion) http://bilimland.kz/en/content/structure/229-physics#lesson=3292
8	Solving problems at the blackboard after some solved examples by teacher (Appendix D)	Working individually and asking for clarification on unclear aspects	Checking results of solved problems by pupils at the blackboard	White board, workbook, teacher's PPP
6	Solving more interactive problems in order to learn the difference between angular and tangential speeds (Appendix E)	Watching and taking notes, solving examples	Q&A	Projector, smart board, PPP from Bilimland.kz (Physics course – Mechanics – Kinematics – Angular velocity. Angular acceleration) http://bilimland.kz/en/content/structure/783-mechanics#lesson=5891
2	Demonstration of circular motion by rotating a bucket filled with water in it in order to explain centripetal force	Watching and discussing in pairs	Q&A	Bucket, water, rope

Time	Content and teacher activity	Learner activity	Formative assessment (On-going assessment)	Learning materials and resources
5	Finally solving **Schumacher's problem of finding optimum speed** to pass the turn safely (Appendix F)	Working in pairs and trying to find optimum speed by taking necessary information from teacher's PPP	Q&A, observation	Projector, smart board, PPP with information of car and road properties (coefficient of friction, radius of turn, mass of the car, gravity)
2	Giving homework: problems from their workbook, find and show one exclusive, extraordinary example from real life of circular motion (Appendix G)	Taking notes, listening	Checking homework (next week)	Projector, smart board, workbook
Break time	Feedbacks	Giving feedbacks to the teacher by writing their comments on stickers and stick them on a board	Receiving feedback stickers	Stickers, board

APPENDIX A



QUESTIONS

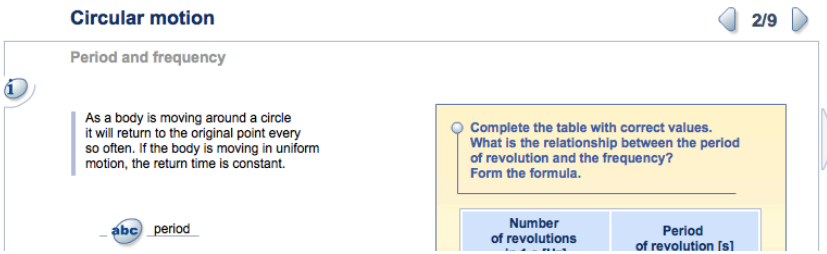
1. How do we call change of the position from initial to final position?
2. What is the vector quantity of the speed?
3. E_p=mgX, what is X in formula?
4. V_{avg}=dX/dM, what is M in formula?
5. The ratio of the change in velocity to the time interval
6. A group of quantities that has only magnitude
7. Acceleration is _____ quantity
8. How do we call maximum distance that is covered by the object by a projectile?

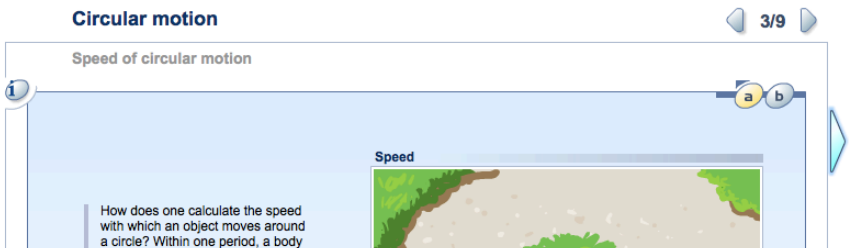
APPENDIX B

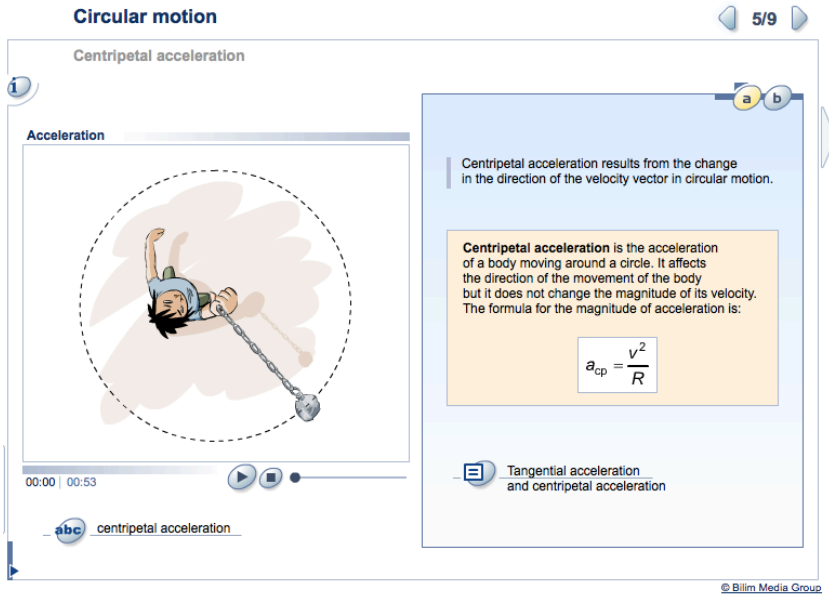
TERMINOLOGY

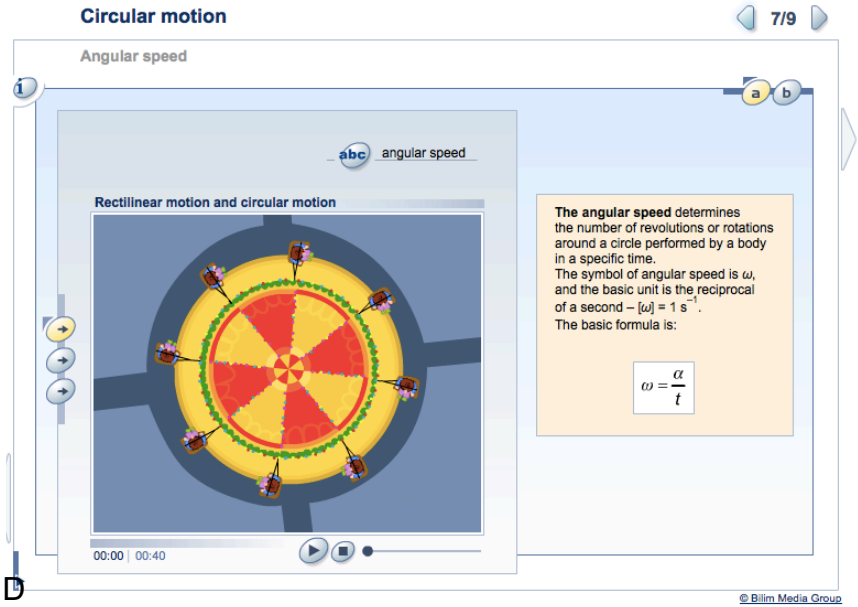
#	WORD	TRANSLATION
1	Period	Период
2	Frequency	Частота
3	Tangential speed (linear speed)	Тангенциальная скорость (линейная скорость)
4	Angular speed	Угловая скорость
5	Centripetal force	Центростремительная сила
6	Revolution	Оборот
7	Centripetal acceleration	Центростремительное ускорение
8	Circumference	Длина окружности
9	Uniform circular motion	Равномерное круговое движение

APPENDIX C









APPENDIX D

Example:

The drum of a washing machine rotates 1200 times in 1 minute.

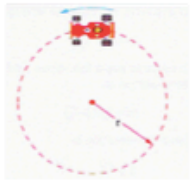
a) What is the period and frequency of the drum?

b) What is the angular speed of the drum?

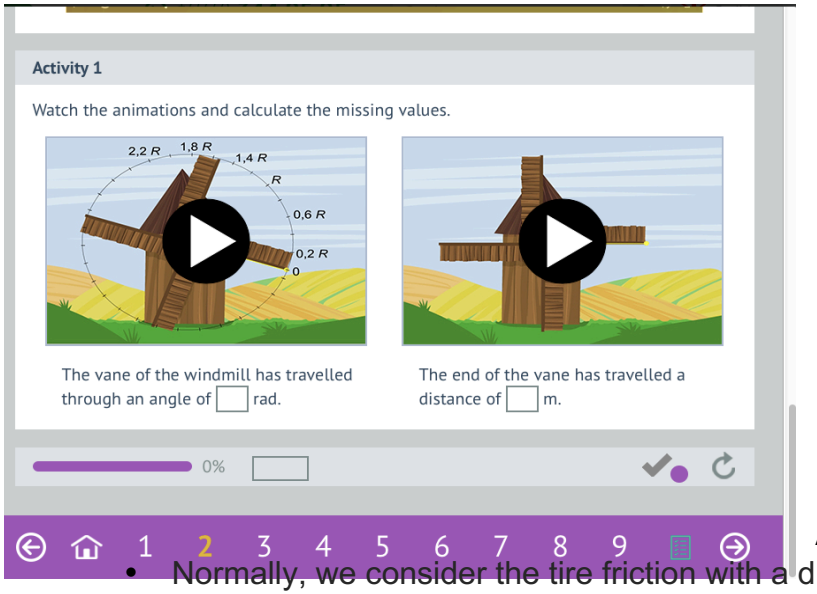
c) İf the diameter of the drum is 40cm, what is the tangential speed of a point on the drum? (take ∏=3)

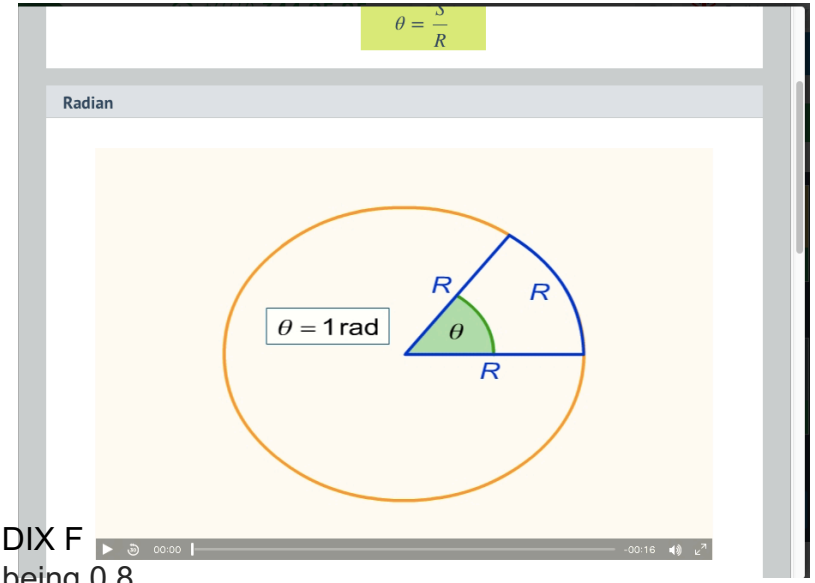
Example

A 4 kg toy car is following a circular path with a constant speed of v=3 m/s and a period of 2 s. If the r=1 m, find the centripetal acceleration and force.



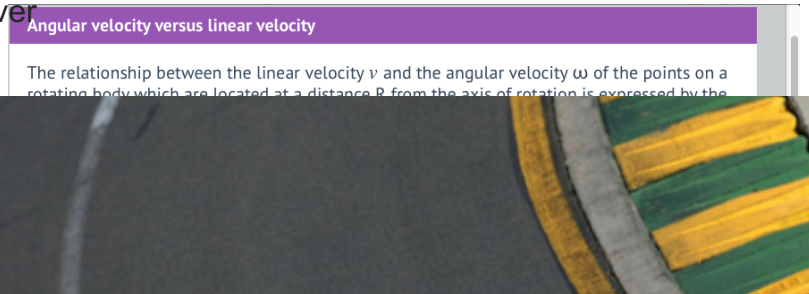
APPENDIX E





APPENDIX F

- Normally, we consider the tire friction with a dry road being 0.8
- Most F1 cars weigh around 1,300 pounds with the driver
- Radius of curvature is 25 meters
- Gravity take as 9,8 m/s^2



APPENDIX G