Opening up Assessment: Open Tools and Item Banks

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POP THE QUESTION ANYWHERE

PLAN, CREATE AND SHARE QUESTIONS SIMPLY. EASILY EMBED ASSESSMENTS ON ANY PAGE ON ANY WEBSITE.

EXAMPLE ASSESSMENT >
The Challenge
The Potential?

- Do for assessments and items, what’s been done for content (whole courses, lectures, videos)
- Embed Anywhere
- Share
  - Don’t reinvent the wheel for every course
- Evaluate, Record and Track Responses
  - Scale ➔ More use of items/assessments for validity
  - May lead to evidence of impact?
Focus: Formative Assessment

- Putting mechanisms for students to check their understanding / mastery of concepts directly in course materials

- Primarily for formative (self-check, understanding) not summative (exams or formal assignments)
What’s done today in OER with embedded formative assessment?
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Assessments

- 1.1.4 Assessment: Washington State Board for Community and Technical Colleges’ MyOpenMath: “Section 5.1: Circles Graded Homework”

- 1.2.5 Assessment: Washington State Board for Community and Technical Colleges’ MyOpenMath: “Section 5.2: Angles Graded Homework”

- 1.2.5 Assessment: Washington State Board for Community and Technical Colleges’ “Chapter 5 Quiz 1”

  Link: Washington State Board for Community and Technical Colleges’ “Chapter 5 Quiz 1” (PDF)

Instructions: This assessment covers subunits 1.1 and 1.2. Complete this quiz after you have worked through the readings, web media, and assignments for subunits 1.1 and 1.2.

- 1.3.4 Assessment: Washington State Board for Community and Technical Colleges’ MyOpenMath: “Section 5.3: Points on Circles using Sine and Cosine Graded Homework”

- 1.3.4 Assessment: Washington State Board for Community and Technical Colleges’ “Chapter 5 Quiz 2”
Quiz #1a

NAME__________________________

5.1, 5.2 Lippman/Rasmussen

Answers without proper justification may not receive full credit. Show your work algebraically.

1) Write an equation for a circle with diameter 20 centered at the point (-2, 4)

2) Find the point in the first quadrant where the line \( y = 2x \) intersects a circle of radius 3 centered at the origin.

3) Convert 160 degrees to radians. Give an exact answer.
OCW Scholar courses are designed for independent learners who have few additional resources available to them. The courses are substantially more complete than typical OCW courses and include new custom-created content as well as materials repurposed from MIT classrooms. The materials are also arranged in logical sequences and include multimedia such as video and simulations.

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- Mathematics
- Mechanical Engineering
- Physics

Biology

Fundamentals of Biology

*Fundamentals of Biology* focuses on the basic principles of biochemistry, molecular biology, genetics, and recombinant DNA. These principles are necessary to understanding the basic mechanisms of life and anchor the biological knowledge that is required to understand many of the challenges in everyday life, from human health and disease to loss of biodiversity and environmental quality.

Instructors: Prof. Eric Lander, Prof. Robert Weinberg, Prof. Tyler Jacks, Prof. Hazel Sive, Prof. Graham Walker, Prof. Sallie Chisholm, Dr. Michelle Mischoke

View Course
Lecture 14: Generating EM Waves, Energy, Scattering

Learning Objectives
By the end of this lecture, you should:
- relate E and B fields to the Poynting vector.
- know the solar constant and why it does not correspond simply to an E field.
- describe in general terms the derivation of the Larmor formula.
- describe antenna emission and Rayleigh scattering (including polarization).

Lecture Activities
- Watch the Lecture 14 video with Professor Lewin (01:17:16)
- Read the accompanying Lecture 14 viewing notes (PDF)
- Also available: Lecture 14 video transcript (PDF)

Check Yourself
- Contrast the energy conversion that was demonstrated in the lectures, in which a light bulb was lit through EM wave energy being received in an antenna, with what has to be done to collect solar energy that has a Poynting vector in principle corresponding to an electric field of 1000 V/m.
- View hiding answer
As one of the demonstrations showed, the EM radiation is highly polarized. If the antenna is in the plane of polarization, there is in principle direct acceleration of electrons in the wire of the antenna, and this could be fairly efficient at GHz or less frequencies. By contrast, the polarization in solar energy is random, so one could not align an antenna with it. Further, at the high frequency of light, antennas are not effective and absorption of energy involves molecules and atoms, so getting a current flowing is not as simple as in an antenna. If solar energy conversion was easy, the relatively large power density would have motivated us to have it long ago.
## Check Yourself

### Multiple Choice Questions

**Question 1 of 3**

Which of the following characteristics of experimental design ensure causation when done correctly?

- A. Dividing people into two or more conditions through random assignment.
- B. Doing a statistical analysis of the data.
- C. Being sure to have both a dependent and independent variables.
- D. Making sure that all participants are identical.

### Short Essay

When conducting psychological research there are three main research designs that researchers use. All three research designs can collect, analyze, and interpret data, but each has important differences. Name and describe each of the three research designs. Describe the advantages and disadvantages of each design. Give a research example of each design.

**Sample Answer**

The three research designs are **descriptive research**, **correlational research**, and **experimental research**.

**Descriptive research** provides a description or snapshot of the current state of affairs or some phenomenon in order to understand the nature of that phenomenon. Advantages of descriptive research is that it provides a complete picture of the situation and is often real-world or events that are naturally occurring. Disadvantages are that there is no statistical relationship, beyond anecdotal evidence, that are studied; causal influence cannot be inferred, and it is difficult to determine which variables are influential in the study due to the inability to repeatedly measure all the variables and to even know what all of the variables are.

**Correlational research** tests relationship between two or more variables. Advantages of correlational research are statistical tests to show the relationship is unlikely to occur due to chance, the ability to make predictions about future outcomes, and it can be used to assess real-world events. The main disadvantage is that no causal relationship can be inferred from the relationship of the variables.

**Experimental research** is used to assess the causal relationship between two or more variables by manipulating independent variables and testing the causal impact on a dependent variable. While it is more difficult to assess real-world events, experimental research has all of the other advantages of correlational research in addition to the ability for causal inference. Disadvantages are the difficulty to manipulate important variables or many variables at one time and the cost of conducting experiments.
Learning Activities

Guided Activities
Read through the class slides carefully. They explain all of the concepts from the module.
Slides: Angular Momentum (PDF - 1.3MB)

Self-Assessment
Do the Concept Questions first to make sure you understand the main concepts from this module. Then, when you are ready, try the Challenge Problems. If you are struggling with the Challenge Problems, watch the Homework Help Session videos, which will give you tips on how to tackle problems of this type.

Concept Questions
Concept Questions (PDF)
Solutions (PDF)

Challenge Problems
Challenge Problems (PDF)
Solutions (PDF)
Angular Momentum
Concept Questions

Question 1: Angular Momentum

\[ \bullet \rightarrow \mathbf{v} \]
\[ m \]

In the above situation where a particle is moving in the x-y plane with a constant velocity, the magnitude of the angular momentum \( |\mathbf{L}_0| \) about the origin

1. decreases then increases,
2. increases then decrease,
3. is constant,
4. is zero because this is not circular motion.
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Final course details are being wrapped up at this time. Your final standing will be available shortly.

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SPKAKER: As our next step, we are going to analyze the response of the amplifier to small signals mathematically. So I'm going to start with the vO versus vI equation for the amplifier given right here. And we've analyzed this before as part of large signal analysis.
S10E1: INCREMENTAL VOLTAGE (1 point possible)

For the simple common-source amplifier the lecturer just derived expressions for the operating point (bias) output voltage $V_O$ as

$$V_O = V_S - \frac{R_L \cdot K}{2} \cdot (V_I - V_T)^2$$

and for the total output voltage $v_O$, including the incremental output voltage $v_o$

$$v_O = V_O + v_o = V_S - \frac{R_L \cdot K}{2} \cdot [(V_I - V_T)^2 + 2 \cdot (V_I - V_T) \cdot v_i + v_i^2]$$

In the space provided below write an algebraic expression for the best linear approximation to the incremental output voltage $v_o$, assuming that the incremental input voltage $v_i$ is very small. Express your answer in terms of the device parameters $K, V_T, R_L$, the bias voltages $V_S$ and $V_I$, and the incremental input voltage $v_i$. Be careful, algebraic expressions involving incremental quantities are case sensitive.
Our Approach
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POP THE QUESTION ANYWHERE

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EXAMPLE ASSESSMENT >
Comparing Fractions

Question 1

\[
\frac{5}{12} \quad \text{?} \quad \frac{3}{5}
\]

- Greater than (>)
- Less than (<)
- Equivalent (≈)

Check Answer
Proof-of-Concept

OpenAssessments.org

- Embed an assessment in any web content
- Focus on formative assessments
- Start with limited question types (multiple-choice/single answer, short answer)
Demo!
(cross your fingers)

Justin Ball
Where might we embed assessments?
Real Remix Realized

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Learning content

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Momentum

Momentum is a physical quantity which is closely related to forces. Momentum is a property which applies to moving objects, in fact it is mass in motion. If something has mass and it is moving then it has momentum.

Definition

Momentum

The linear momentum of a particle (object) is a vector quantity equal to the product of the mass of the particle (object) and its velocity.

The momentum (symbol \( \vec{p} \)) of an object of mass \( m \) moving at velocity \( \vec{v} \) is:

\[ \vec{p} = m \vec{v} \]

Momentum is directly proportional to both the mass and velocity of an object. A small car travelling at the same velocity as a big truck will have a smaller momentum than the truck. The smaller the mass, the smaller the momentum for a fixed velocity. If the mass is constant then the greater the velocity the greater the momentum. The momentum will always be in the same direction as the velocity because mass is a scalar not a vector.

Vector nature of momentum

A car travelling at 120 km·hr\(^{-1}\) will have a larger momentum than the same car travelling at 60 km·hr\(^{-1}\). Momentum is also related to velocity; the smaller the velocity, the smaller the momentum.

Different objects can also have the same momentum, for example a car travelling slowly can have the same momentum as a motorcycle travelling relatively fast. We can easily demonstrate this.

Consider a car of mass 1000 kg with a velocity of 8 m·s\(^{-1}\) (about 30 km·hr\(^{-1}\)) East. The momentum of the car is therefore:

\[ \vec{p} = m \vec{v} \]
**Worked Example**

A soccer ball of mass 420 g is kicked at 20 m·s\(^{-1}\) towards the goal post. Calculate the momentum of the ball.

**Step**

Identify what information is given and what is asked for.
Step
Identify what information is given and what is asked for
The question explicitly gives:
  • the mass of the ball, and
  • the velocity of the ball.

The mass of the ball must be converted to SI units.

$420 \text{ g} = 0,42 \text{ kg}$

We are asked to calculate the momentum of the ball. From the definition of momentum, $\vec{p} = m\vec{v}$ we see that we need the mass and velocity of the ball, which we are given.

Step
Do the calculation
We calculate the magnitude of the momentum of the ball,

$\vec{p} = m\vec{v}$

$= (0,42)(20)$

$= 8,40 \text{ kg} \cdot \text{m} \cdot \text{s}^{-1}$

Step
Quote the final answer
We quote the answer with the direction of motion included, $\vec{p} = 8,40 \text{ kg} \cdot \text{m} \cdot \text{s}^{-1}$ in the direction of the goal post.
Activity  Try it for yourself!

Comparing Fractions

Question 1  1 of 10

\[\frac{5}{12} \overset{?}{\sim} \frac{3}{5}\]

- Greater than (>)
- Less than (<)
- Equivalent (=)

Check Answer  Previous  Next
Open Item Banks

David Wiley

Bueller?... Bueller?... Bueller?...
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