



Company: Realizeit

Document Title:

Learning: Content, Activities and Questions in Realizeit v1

Platform Version: 2

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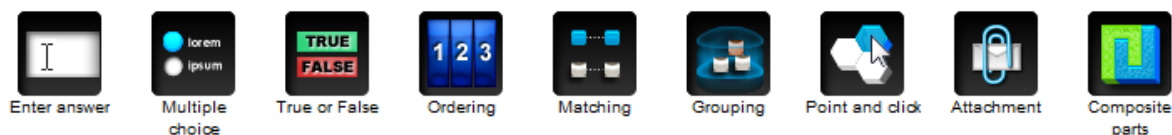
1 Introduction

This document takes a detailed look inside a node in Realizeit^{it}: at the learning content, the learning activities and the questions that can be provided for a learner therein.

The first section addresses the questions, pulling examples from varied subject domains. The following section outlines the learning bits or sections and their pedagogical nature, again with examples. Lastly, examples of learning activities which have been employed in Realizeit^{it} to date are provided.

2 Question types

Many different question types are available in Realizeit^{it}. These questions can provide direct evidence on the learner's understanding and attainment when the learner is doing determine knowledge, learning, practicing or revising. The questions can also be integrated into different interactive learning activities such as worked examples and case studies.



Note: All question types can be used in conjunction with Realizeit's variables. This means that, instead of static questions, every instance of a question can be dynamically-generated with different numbers or letters or phrases.



Enter answer

2.1 Enter answer

A space is provided for the learner to enter the answer or answers to the question. Different sized inputs are possible. This question type allows for fill in the blanks questions and word search questions to be created. It also integrates with widgets to retrieve the learner's response, for example, the geometry widget. Some specific examples are detailed below.

2.1.1 Number input

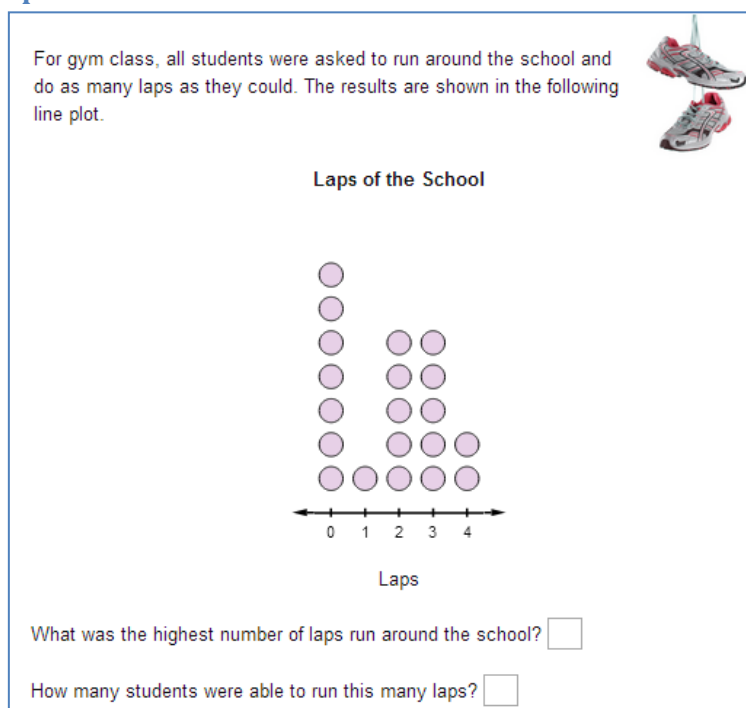


Figure 1: Reading Line Plots

2.1.2 Word input

In a breed of cats, the gene for black coat is dominant to the gene for white coat, and the gene for short hair is dominant to the gene for long hair.

If both parents are pure-breeding what is the condition of the alleles?

What would the condition of the genotype of the F_1 generation be?



Figure 2: Dihybrid Crosses

2.1.3 Fill in the blanks

Placeholders for the inputs can be arranged so that the questions are fill in the blanks-style.

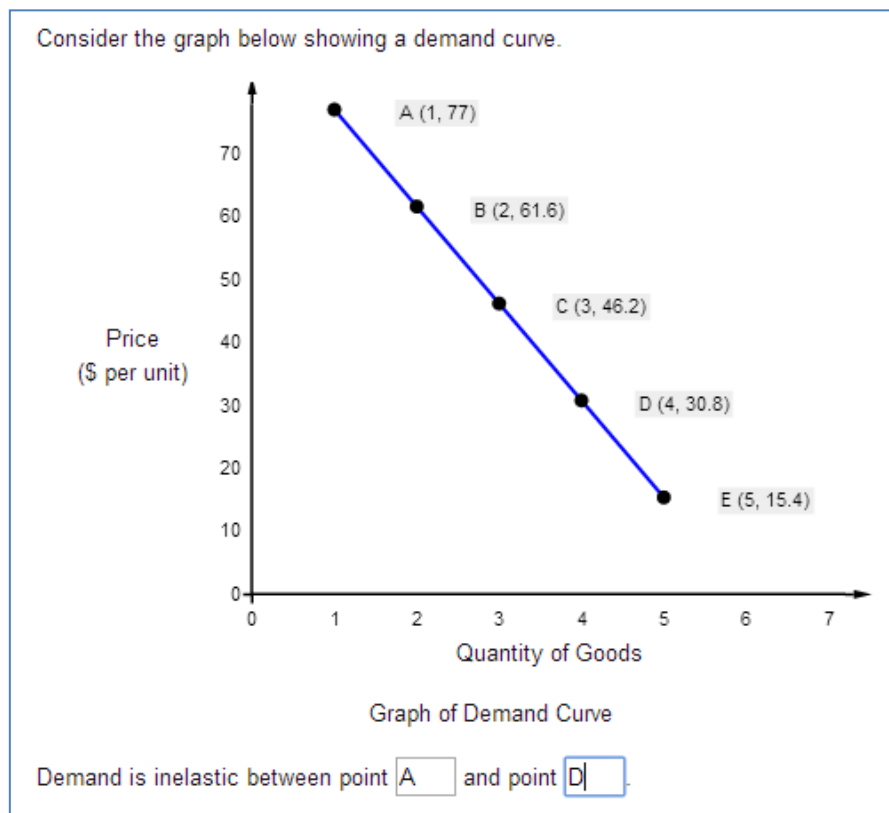


Figure 3: Elasticity of Demand

In pure-breeding pea plant, the gene for tall is dominant to the gene for dwarf, and the gene for red is dominant to the gene for white. Both parents are pure-breeding. Fill in the blank spaces on the dihybrid cross below:

Parents:	Tall, Red	x	Dwarf, White
Genotype Parents:	<input type="text" value="TTRR"/>	x	<input type="text" value="ttrr"/>
Gametes:	<input type="text" value="TR"/>	x	<input type="text" value="tr"/>
F ₁ genotypes:		<input type="text" value="TtRr"/>	
Phenotype:		<input type="text" value="tall red"/>	
F ₁ x F ₁	<input type="text" value="TtRr"/>	x	<input type="text" value="TtRr"/>
Gametes:	<input type="text" value="TR, Tr, tR, tr"/>	x	<input type="text" value="TR, Tr, tR, tr"/>

Figure 4: Dihybrid Crosses

2.1.4 Dropdown

An input can be converted into a dropdown list for the learner to choose a response from.

Consider the demand curve on the right.

Demand is described as .

The elasticity coefficient is .

- equal to 1
- equal to 0
- infinity
- greater than 1
- less than 1

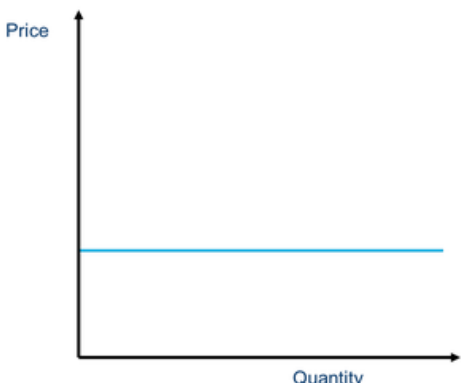


Figure 5: Elasticity of Demand

Choose the best verb to fit the following sentence. Instead of "talked":

My mother and my aunt about their vacation to Italy last summer happily.

- bickered
- chatted
- screamed

Figure 6: English Composition

2.1.5 Phrases

The system can search for key phrases and alternatives to those phrases in the learner's response. This allows for sentence- and paragraph-style answers.

What type of plants did Mendel conduct experiments on and what did he want to observe?

Mendel investigated the seven characteristics of pea plants. He observed the phenotypic and the genotypic traits of the pea plants.



Figure 7: Law of Segregation

2.1.6 Mathematical expressions

The Math panel provides operators, symbols, functions, parentheses, matrices, etc. which allows the learner to correctly compose mathematical expressions.

Victoria purchased a car worth \$10,000. The car's value depreciates at 10% per year.

Let x represent the number of years.

Create a function which can be used to model this situation.

\times \div π $\frac{a}{b}$ a^b $()$

$$f(x) = 10000(0.9)^x$$



Figure 8: Creating Exponential Functions - Math Panel

The basic Math panel provides a neater version of the Math panel, with less functionality for simpler responses.

\$761 was invested in an account with 8% annual yield.

Let x represent the number of years the money was left in the account.

Create a function, $f(x)$, which can be used to model this situation.



\times \div π $\frac{a}{b}$ a^b $()$

$$f(x) = 761(1.08)^x$$

Figure 9: Creating Exponential Functions - Basic Math Panel

2.1.7 Answering with the Geometry widget

The learner's response can be delivered via the Geometry widget (based on the Cartesian plane). This can involve plotting a point or points, graphing a function, or moving a point.

2.1.7.1 Plotting a point

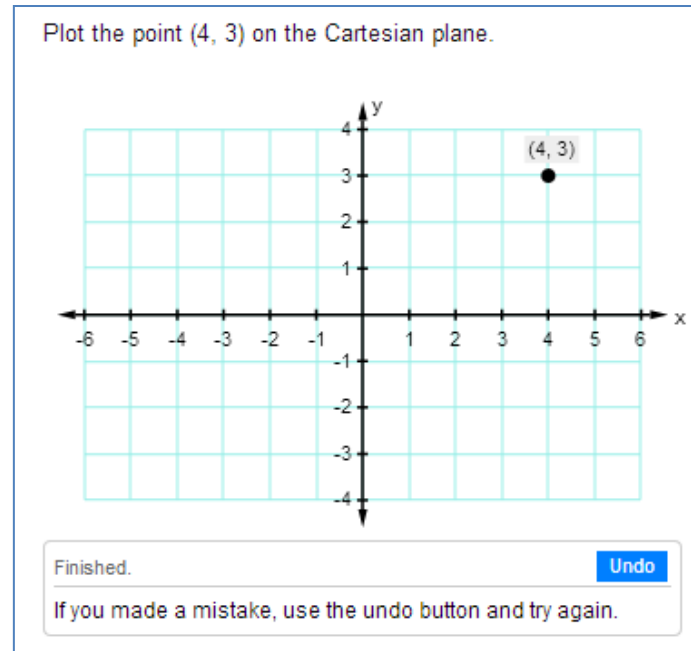
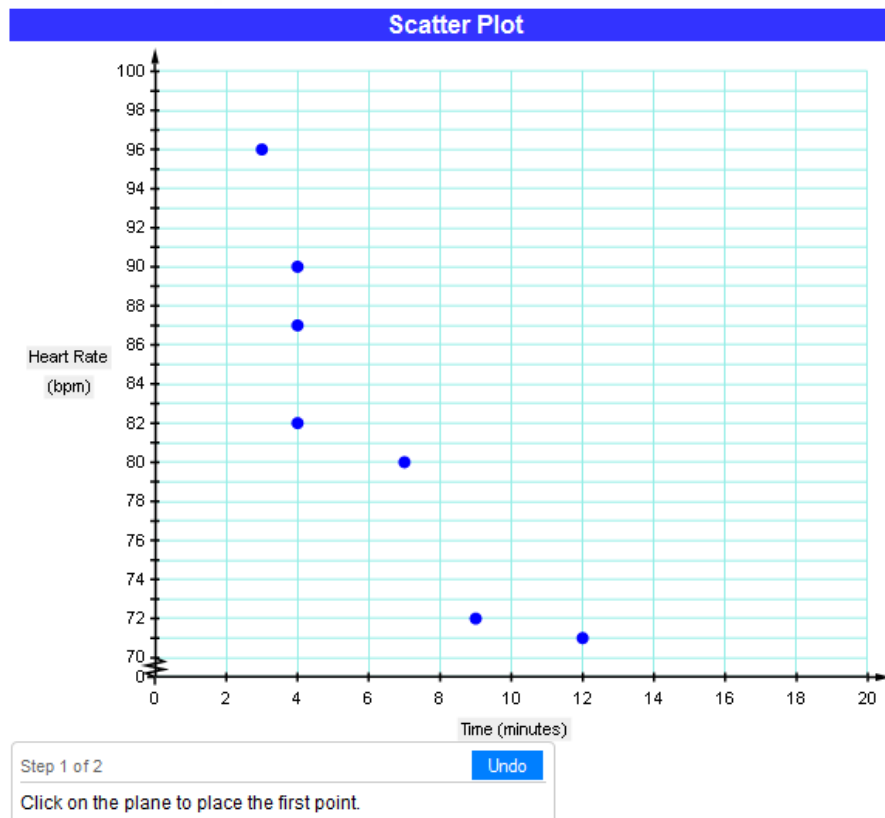


Figure 10: Functions and Graphs Cartesian Plane

2.1.7.2 Graphing a function



A group of skiers, both beginners and experienced, were competing in a short downhill race. For competition purposes, the time taken to complete the race and the heart rate at completion were recorded. These are displayed in the scatter plot below:



Draw the line of best fit by clicking the area once where you want the line to start and once where you want the line to finish.

Figure 11: Lines to Model Relationships - before answering

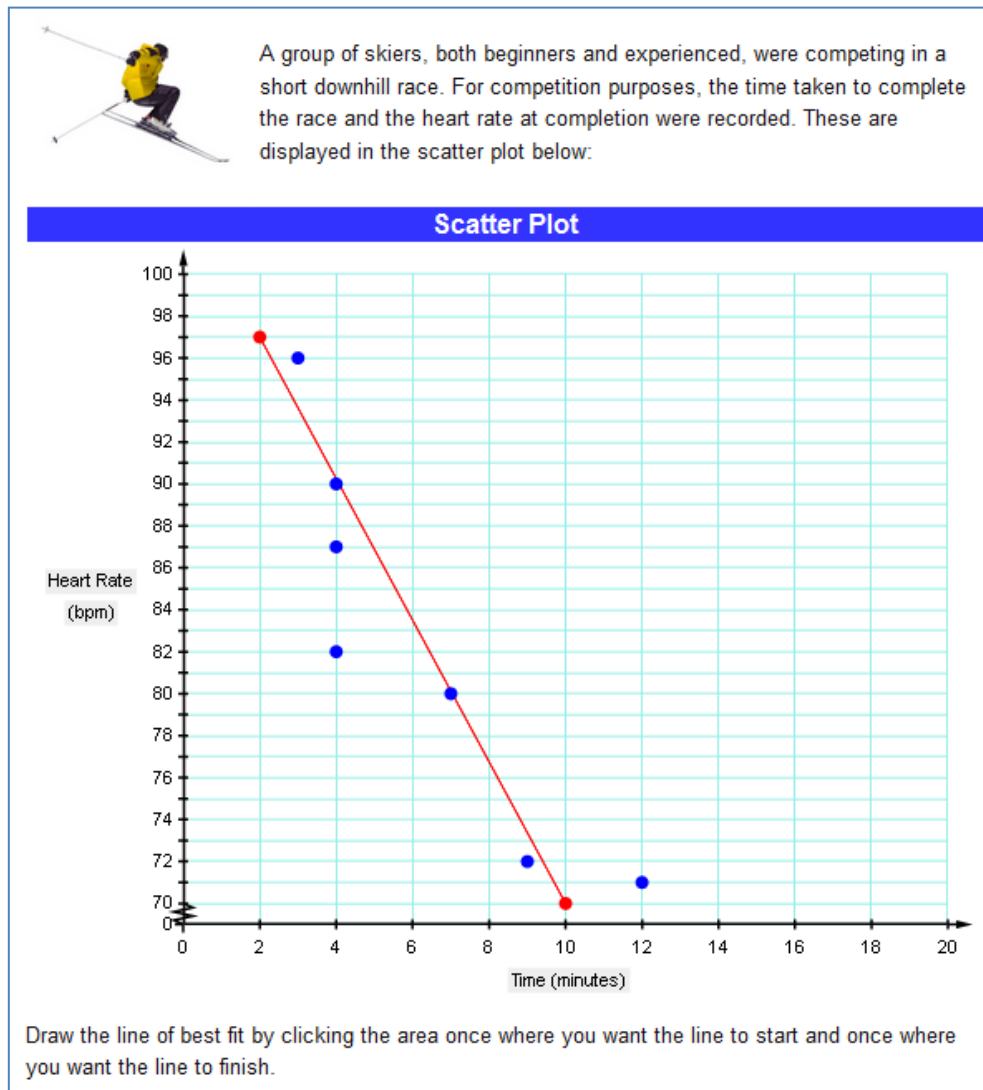
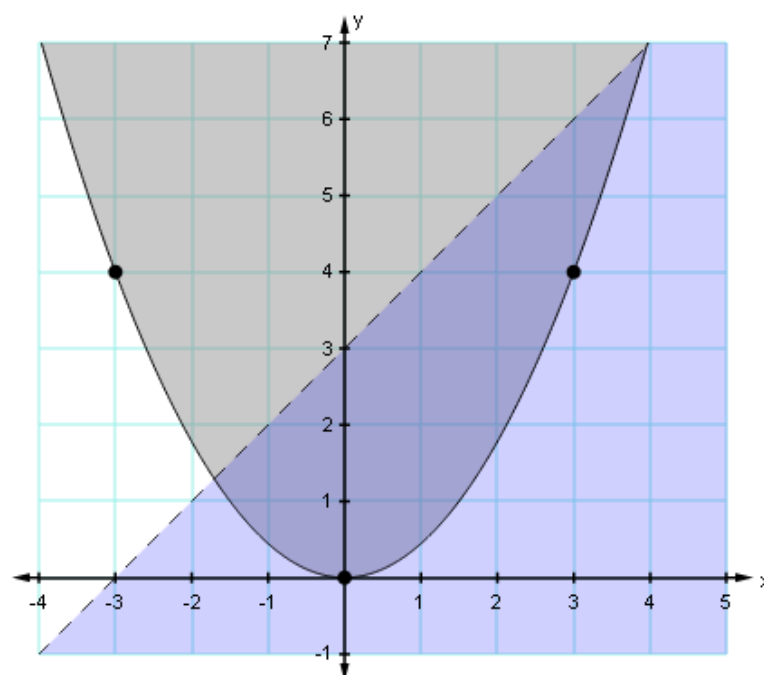


Figure 12: Lines to Model Relationships - learner response

Graph the parabola by plotting the vertex and two points on the curve. Shade the area that satisfies $y \geq x^2 + 1$.



Finished. [Undo](#)

If you made a mistake, use the undo button and try again.

Define points manually:

x: 0	y: 0	Plot
x: -3	y: 4	Plot
x: 3	y: 4	Plot
x: -1	y: 4	Plot

☐ parabola dashed

Figure 13: Systems of Nonlinear Inequalities

2.1.7.3 Dragging a point

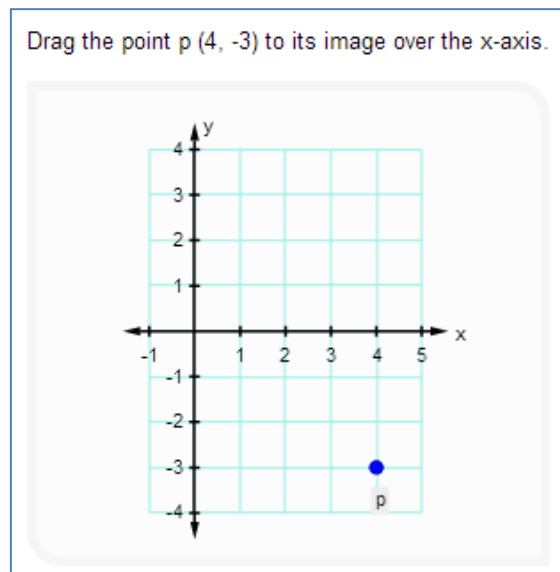


Figure 14: Axial Symmetry X-axis



Multiple choice

2.2 Multiple choice

The learner can choose one or more correct answers from a list of choices. There is no restriction to the traditional four choices. Additional distracters can be authored so that the system generates a subset of choices from the list of available choices.

2.2.1 Single correct choice

By employing the midpoint method to calculate the price elasticity of demand, it eliminates the problem of:

- ☒ Total revenue not changing at all.
- ☐ Total revenue dropping when price drops, and the demand is inelastic.
- ☐ Calculating different elasticities because price and quantity are inversely related.
- ☐ Calculating different elasticities depending on whether the price increases or decreases.
- ☐ Total revenue rising when price drops, and the demand is elastic.

Figure 15: Elasticity of Demand

Which of the following is a verb?

- ☐ department
- ☒ boasts
- ☐ usually
- ☐ kind

Figure 16: English Composition

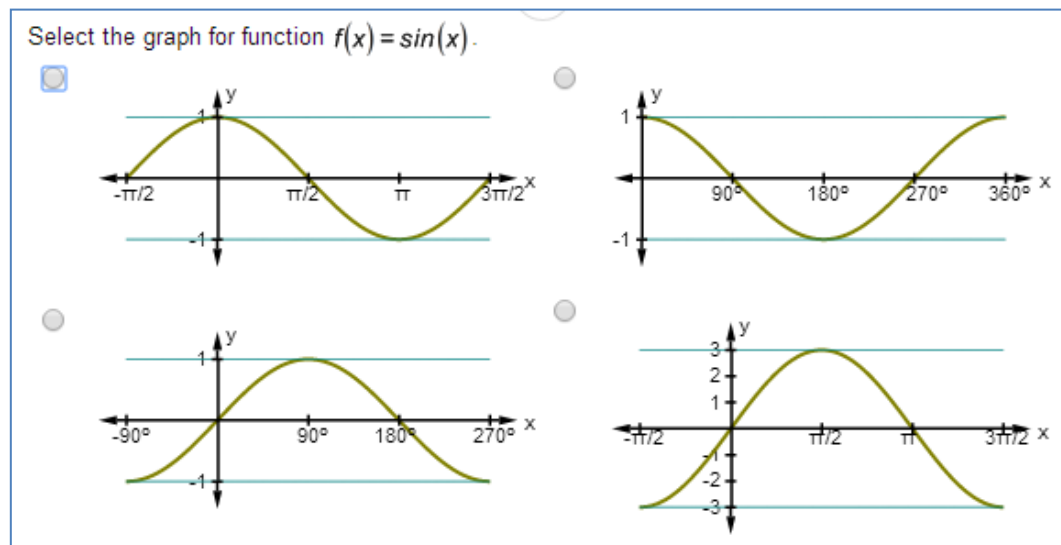


Figure 17: Graphing the Sine Function

2.2.2 Multiple correct choices

Which of the following are approximately unitary elastic? Check all that apply.

- ☐ restaurant meals
- ☒ airline travel, long-run
- ☐ television receivers
- ☒ radio receivers
- ☒ gasoline, short-run
- ☐ salt
- ☒ fresh tomatoes

Figure 18: Elasticity of Demand

Which of the following Punnett squares are correct?

☐

	TR	TTr	tR	tr
TR	TTRR	TTRr	TtRR	TtRr
Tr	TTrR	TTrr	TtRr	Ttrr
tR	TtRR	TtRr	ttRR	ttRr
tr	TtRr	Ttrr	ttRr	ttrr

☒

	TR	Tr	tR	tr
TR	TTRR	TTRr	TtRR	TtRr
Tr	TTrR	TTrr	TtRr	Ttrr
tR	TtRR	TtRr	ttRR	ttRr
tr	TtRr	Ttrr	ttRr	ttrr

☒

	TR	Tr	tR	tr
TR	TTRr	TTRr	TtRt	TtRr
Tr	TTrR	TTrr	TtRr	Ttrr
tR	TtR	TtRr	ttRr	ttRr
tr	TtRr	Ttrr	ttRr	ttrr

☐

	BS	Bs	bS	bs
BS	BBSS	BBss	BbSS	Bbss
Bs	BBss	BBss	Bbss	Bbss
bS	BbSS	Bbss	bbSS	bbss
bs	Bbss	Bbss	bbss	bbss

Figure 19: Dihybrid Crosses

2.3 True or False



True or False

The learner can choose from two choices.

Heredity is a type of gene
☒ True
☐ False

Figure 20: Heredity



Ordering

2.4 Ordering

A list of items is provided for the learner to move to place in order.

Drag and drop the steps on the pathway of tears into order from the lacrimal lake to the nasal cavity.

Common canaliculus
Lacrimal sac
Lacrimal lake
Lacrimal canaliculus
Nasolacrimal canal

Figure 21: Lacrimal Gland

The following table presents the noon time temperatures recorded in certain American states on a winter's day.

State	Temperature ($^{\circ}\text{C}$)
Colorado	3.3
Washington	-5.3
Florida	$5\frac{1}{2}$
Ohio	-3.2
Mississippi	$5\frac{1}{5}$
Tennessee	$4\frac{1}{10}$

Order the states from lowest temperature to highest.

Tennessee

Ohio

Mississippi

Colorado

Washington

Florida

Figure 22: Order Rational Numbers

2.5 Matching



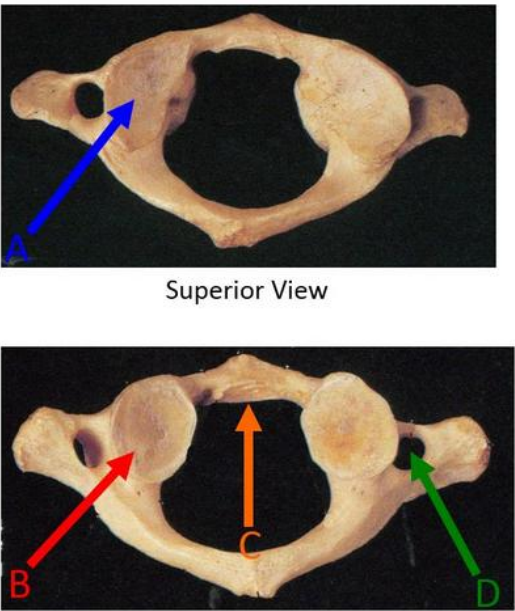
The learner moves items to match them against each other.

Match the cranial nerves with what they innervate

CNVI		sense of vision
CNI		
CNV		sensory of cranium
CNXII		pharynx
CNII		sense of smell
CNX		motor of facial muscles
CNVII		oropharynx

Figure 23: Cranial Nerves

Correlate the correct label with the appropriate features.



The image shows two views of a cervical vertebra. The superior view (top) has a blue arrow labeled 'A' pointing to the transverse foramen. The inferior view (bottom) has a red arrow labeled 'B' pointing to the inferior articular facet, an orange arrow labeled 'C' pointing to the transverse foramen, and a green arrow labeled 'D' pointing to the superior articular facet.

Superior View

Inferior View

B	A	D	C
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Inferior articular facet	Transverse foramen	Superior articular facet	Fovea for the Dens

Figure 24: C1

2.6 Grouping



Grouping

The learner groups items together.

Group the modifiable and non-modifiable risk factors for his myocardial infarction.

Modifiable

Neither

Renal Failure

Non-Modifiable

High Cholesterol

Diabetes

Gender

Age

Figure 25: Cardiac Case Study - horizontal orientation

For each function, determine if it is quadratic or cubic. Then arrange accordingly.

Cubic functions

$$f(x) = ax^3 + bx^2 + cx + d$$

Quadratic functions

$$f(x) = ax^2 + bx + c$$

$y = -32x + 4x \times x$

$g(x) = 5x^2 - 30x^3 + 6$

$f(x) = 1 - 3x^2$

Figure 26: Polynomials - vertical orientation

2.7 Point and click



Point and click

An image is provided for the learner to select a region, or regions, from.

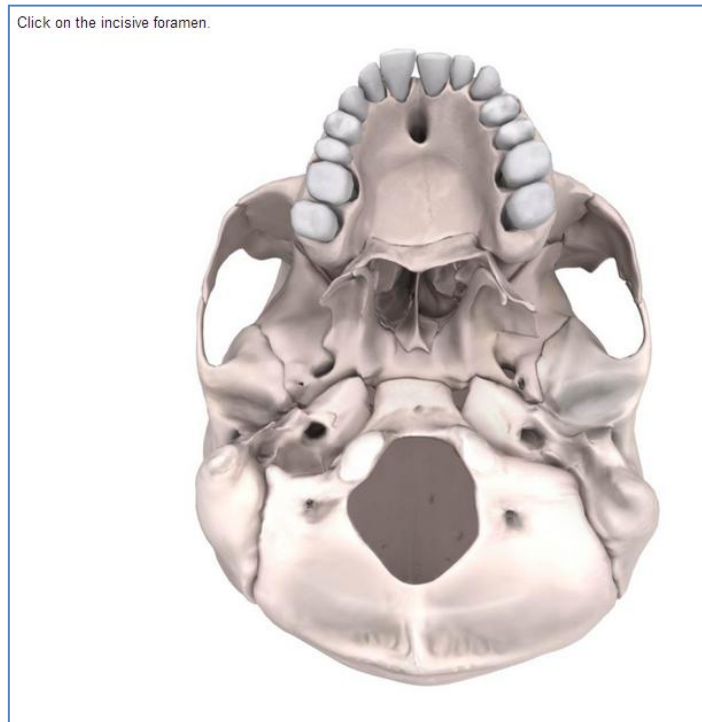


Figure 27: Maxilla Bone before clicking

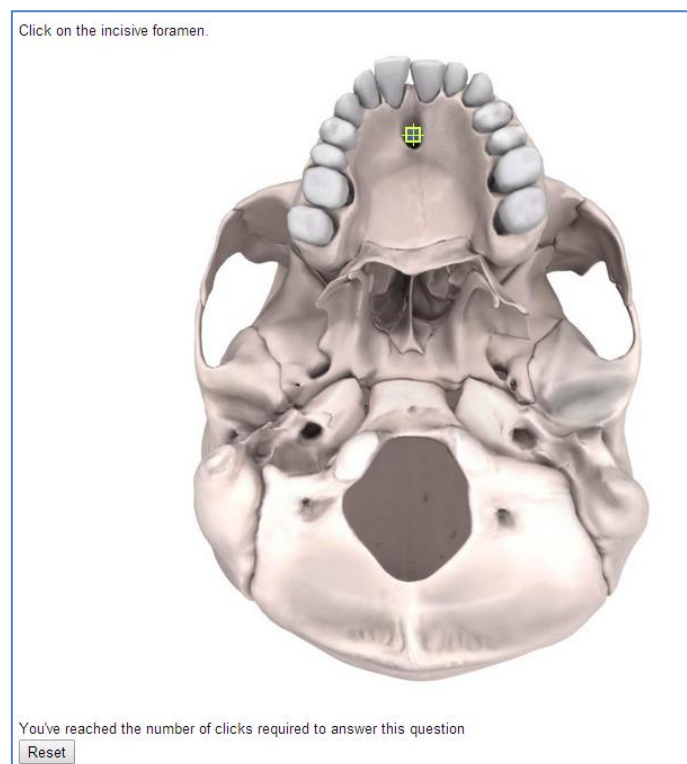


Figure 28: Maxilla Bone after clicking

For both chromosomes, click on the locus.

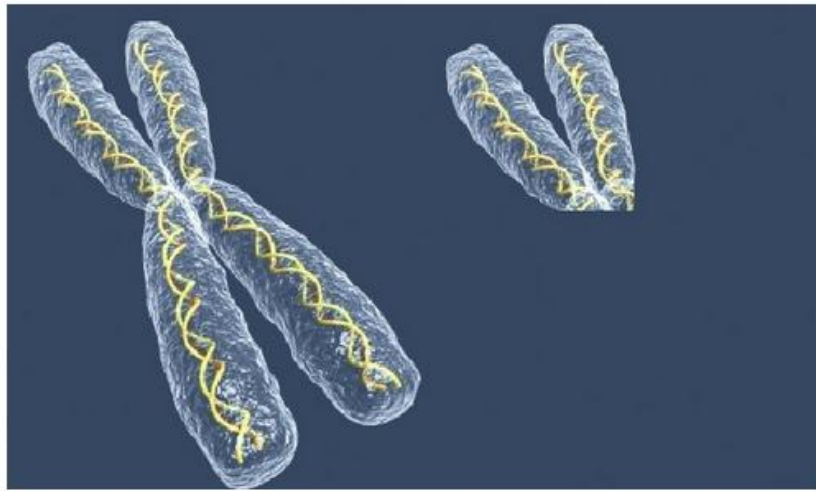
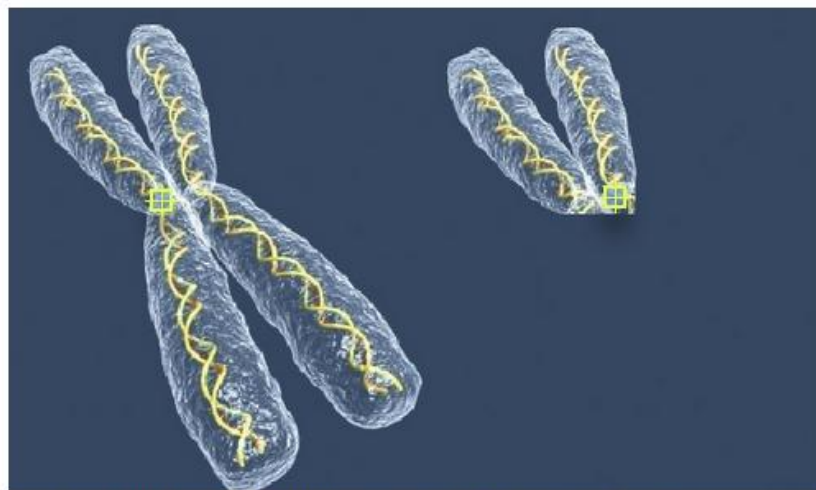


Figure 29: Chromosomes before clicking

For both chromosomes, click on the locus.



You've reached the number of clicks required to answer this question

Reset

Figure 30: Chromosomes after clicking



Attachment

2.8 Attachment

The learner uploads an attachment which the instructor can review and grade.

You did the following in the learning activity: *Using modeling clay or Play-doh, model an atlas including all of its named features.*

Take a picture of your model and attach it here for your instructor to credit.


#	Description	Attachment
1		 My model Edit

Figure 31: C1

The following zip file contains a selection of research papers on the topic of search algorithms.

[Open file: SearchAlgorithms_ResearchPapers](#)

Choose one of papers that interests you. Write a one page critique of the paper. Submit your document here.

#	Description	Attachment
1	Critique only accept: doc, docx, pdf prefer: pdf (max size is 3,000KB)	No attachment Edit

Figure 32: Search Algorithms before attaching

The following zip file contains a selection of research papers on the topic of search algorithms.

[Open file: SearchAlgorithms_ResearchPapers](#)

Choose one of papers that interests you. Write a one page critique of the paper. Submit your document here.


#	Description	Attachment
1	Critique only accept: doc, docx, pdf prefer: pdf (max size is 3,000KB)	 Critique Edit

Figure 33: Search Algorithms after attaching

2.9 Composite parts



Composite
parts

The question consists of multiple parts, each of which can be of any question type.

A shoe store for men sells an average of 30 pairs of shoes per day when the price is \$60 per pair. When 50 pairs of shoes are sold per day, the average price per pair is \$50.

By using the midpoint method, find the absolute value of the price elasticity of demand. Give your answer correct to two decimal places.

2.75

The demand is ☒ elastic ☐ unitary elastic ☐ inelastic.

Figure 34: Elasticity of Demand



Name the bone that was repaired with the surgical plate.

zygomatic

Name the features or landmarks the fractures are nearest.

- ☐ Zygomaxillary suture
- ☒ Temporal process
- ☐ Malar tubercle
- ☐ Maxillary process

Figure 35: Review of Foramina

3 Learning bits

Learning material, learning activities and questions are arranged into learning bits (or sections) of different pedagogical types. Examples of each type are provided here.

When a lesson is delivered to a learner, Realizeit^{it} builds a pathway through the bits for the individual. It dynamically manages that pathway as the learner works forward.

3.1 Introduction

Path for Elasticity of Demand [Edit path](#)

Introduction Learning Worked Example Questions Summary

Introduction

Elasticity of demand is the degree of responsiveness a demand curve has with respect to price.

If quantity drops a great deal when price goes up, the curve is "elastic". If quantity doesn't drop easily with increases in price, the curve is "inelastic".

This node focuses on elasticity of demand. But the study of elasticity goes farther than that. Other elasticity measures include income elasticity of demand, elasticity of supply and cross-price elasticity of demand. Those topics are explained in the learning node that follows this one.

[NEXT](#) ALL

Figure 36: Elasticity of Demand

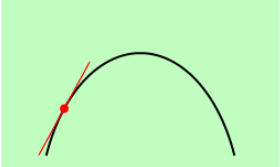
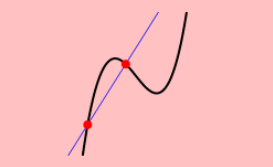
3.2 Learning

Path for Identify the Tangent [Edit path](#)

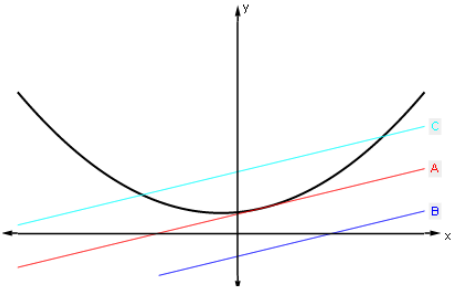
[Learn](#) [Work](#) [Try](#) [Test](#) [Summary](#)

Learning

A line that only touches a curve at one point, not crossing the curve, is **tangent** to the curve.

Tangent to the curve	Not tangent to the curve
	

Which line is the tangent line to the curve below?



☐ Line A
☐ Line B
☐ Line C

[Check](#)

[CONTINUE](#) [ALL](#)

Figure 37: Identify the Tangent


3.3 Example

Path for Indirect Measurement [Edit path](#)


Introduction ✓ Learn ✓ Example ← Example Work Try Test Summary

Example

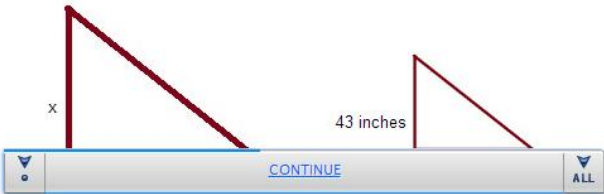
We can use this new knowledge and apply it to other situations, let's calculate the height of the tree below:



In this example the girl will not be able to measure the height of the tree directly, but she can measure her shadow and the shadow of the tree.



She knows her height is 43 inches, her shadow length is 59 inches.
She measured that the tree casted a shadow of 118 inches.



[CONTINUE](#) [ALL](#)

Figure 38: Indirect Measurement

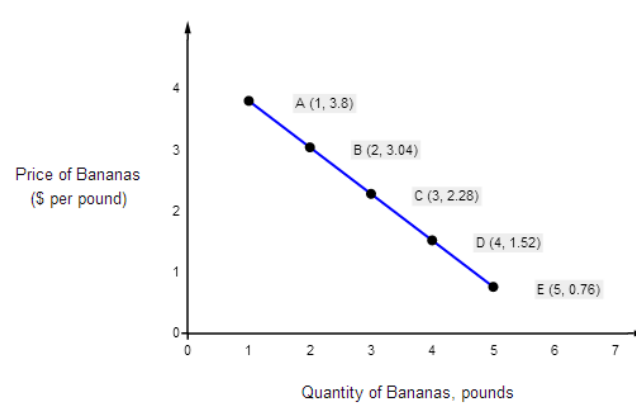
3.4 Worked Example / Work

Path for Elasticity of Demand [Edit path](#)Stop

Introduction
Learning
Worked Example
Questions
Summary

Worked Example

Consider the graph below showing the demand curve for bananas.



Graph of Demand Curve for Bananas

Calculations: Step by Step

It is easier to do the calculations in steps. First, calculate the % change in the quantity demanded, then the % change in price. Finally, divide the % change in Qd by the % change in P.

Initial Value Method

The following uses the interval between points A and B in the demand curve for bananas in the above graph. First assume that point A is the initial point. Then, at A, Q1 = 1 and P1 = 3.8. At B, Q2 = 2, and P2 = 3.04.

$$\% \text{ change in } Qd = \frac{(Q2 - Q1)}{Q1} = \frac{2 - 1}{1} = \frac{1}{1} = 1$$

▼

[CONTINUE](#)

▼
ALL

Figure 39: Elasticity of Demand

Cardiac Dysrhythmia

Edit path

Intro

Learn

Worked Example

Questions

Stop

The following twelve lead ECG is obtained:

These clinical findings are consistent with which condition? heart attack

This patient is having a heart attack, or myocardial infarction. Specifically he is having a STEMI as you can see by the elevated ST segments in leads V4-V6.

What labs and clinical findings support this condition?

- ☐ diaphoresis
- ☐ CK-MB
- ☐ A1C
- ☐ Troponin

Check

CONTINUE

Figure 40: Cardiac Dysrhythmia

3.5 Interactive Example / Practice / Try

Path for Identifying the Bones of the Cranium [Edit path](#)

Learning Objectives ✓ Cranial Divisions ✓ Bones Comprising the Skull ✓ Identify the Bones ✓ Learning Activities Assessment Summary

number of individual bones. The colors of the bones should correspond to the color of the name of the bone in the learning material.

Identify the Bones

Print out the attached file entitled "Skull template", color code, and label the bones of the skull.

Open file: Skull template

Submit your labeled version on this node.

✓ 1 ✗ 2

1

This pair of bones joins anteriorly with the frontal and posteriorly with the occipital:

- ☐ maxillae
- ☐ temporals
- ☐ nasals
- ☒ parietals

2

This bone is so integral to the skull that it can be seen in anterior, lateral, internal, and basicranial (inferior) views:

- ☐ vomer
- ☐ ethmoid
- ☐ palatine
- ☐ sphenoid

1 out of 2 (asking up to 2)

CONTINUE

Figure 41: Identifying the Bones of the Cranium

3.6 Questions / Assessment / Test

Path for Identifying the Bones of the Cranium [Edit path](#)

Learning Objectives ✓ Cranial Divisions ✓ Bones Comprising the Skull ✓ Identify the Bones ✓ Learning Activities ✓ **Assessment** Summary

Assessment

✓ 1 ✓ 2 3

1

True or false: The viscerocranium is the facial skeleton.

☐ False

☒ True

2

Which of the cranial bones are paired? Check all that apply.

☐ occipital


☐ vomer

☒ parietal

☒ temporal

3

Correlate the appropriate bone with the locations.



C

A

Frontal

Sphenoid

Lacrimal

Temporal

Maxillae

Vomer

CONTINUE

Figure 42: Identifying the Bones of the Cranium

3.7 Summary

Path for The Demand Curve [Edit path](#)

Intro

Learning

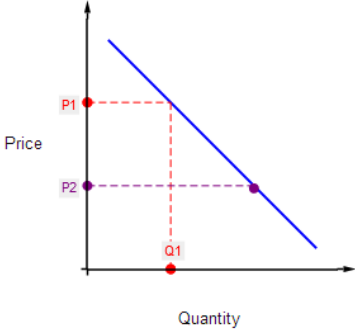
Example

Questions

Summary

Stop

Summary



The Demand Curve is the graphic representation of the relationship between price, and the quantities that consumers are willing to buy, at each price. The **law of demand** states that the quantity demanded of a good falls as the price of the good rises, and the quantity demanded of a good rises as the price of the good falls, Ceteris Paribus (other things held constant).

Those other things that are held constant are variables that influence buyers' behavior. These variables are often called non-price determinants of demand. They include:

- the price of substitute goods
- income
- the price of complement goods
- tastes and preferences
- the number of buyers
- expectations of future price changes.

Whenever one of those variables changes, the demand curve shifts to the right or to the left. The direction and size of the shift depend on which determinant of demand changed, and whether it increased or decreased.

[CONTINUE](#)

ALL

Figure 43: The Demand Curve

4 Learning activities

4.1 Interactive questions

Path for Dihybrid Crosses
[Edit path](#)


Introduction ✓
Learn
Work
Test
Summary

Worked Example

In a breed of cats, the gene for black coat is dominant to the gene for white coat, **and** the gene for short hair is dominant to the gene for long hair.

The first parent is pure-breeding for the **dominant condition** for both traits. The second parent is pure-breeding for the **recessive condition** for both traits.

Find the genotypes and phenotypes of the F_1 progeny also find the possible phenotypes of the F_2 generation.



First let's find the phenotype of the parents. The first parent is pure-breeding for the dominant condition for both traits. The second parent is pure-breeding for the recessive condition for both traits.

So the first parent has a black coat and short hair, the second parent has a white coat and long hair.

Next, let's find the genotype of both parents.

If both are pure-breeding this means that they are both .

Since both parents are pure-breeding they are both homozygous for each trait.

The genotype of the first parent is B B S S

What is the genotype of the second parent who is homozygous for the recessive condition for both characteristics?

- b b s s
- B b S s
- b b
- bs
- B B s s

Figure 44: Dihybrid Crosses

4.2 Videos

4.2.1 Video files

Video files can be embedded in the learning bits and questions.

Orbit [Edit path](#)

Learning Objectives ✓ Orbit ✓ Common Tendinous Ring ✓ **Nerves** Lesions Vasculature and Drainage Cavernous Sinus T

posterior ethmoidal nerve (general afferents from the posterior ethmoidal air cells and sphenoid sinus),

infratrochlear nerve (general afferents from the medial part of upper and lower eyelids, lacrimal sac, skin of upper part of nose)

anterior ethmoidal nerve (general afferents from the dura of the anterior cranial fossa, nasal cavity, skin of the lower part of nose).

GE

1. **III – all extraocular mm. except:**
2. **IV – sup oblique m.**
3. **VI – lat rectus m.**

Left eye

00:14 00:23

GE

CONTINUE ALL

Figure 45: Orbit

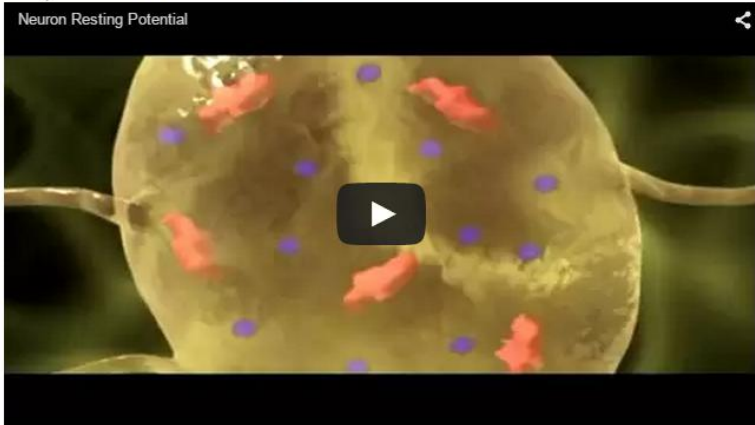
4.2.2 YouTube videos

YouTube videos can be linked to, but it is often nicer to embed them directly in the learning bits. Learners can quickly switch to full screen mode and back.

Neural Communication [Edit path](#)


Introduction ✓ Neural Communication Questions Summary

Neuron Resting Potential



The video below is a more exhilarating (no really!) depiction of the entire process. For this second video there is no narration, so this will give you a chance to refer to the text and provide your own description. <http://youtu.be/90cj4NX87Yk>

Neurotransmitter Synapse 3D Animation



▼ NEXT ▲ ALL

Figure 46: Neural Communication

4.2.3 Interactions with Videos

Video content can be interspersed with interactive questions.

Path for Interquartile Range [Edit path](#)

Introduction ✓ Learn ✓ Learn ✓ Learn ✓ Work ✓ Work Try Test

Worked Examples

Watch the videos and answer the questions which follow.

Example 1

The heights in centimeters for a group of 9 people is as follows:
165, 149, 163, 141, 173, 176, 180, 174, 192

Find the interquartile range of their heights.

Increasing order: 141, 149, 163, 165, 173, 174, 176, 180, 192

What is the median of this data?

00:36 00:39

What is the median of this data?

☒ 174
☐ 175
☐ 156
☐ 173

[Check](#)

CONTINUE ALL

Figure 47: Interquartile Range

4.3 Audio

Who is a U.S Citizen? [Edit path](#)

Intro ✓

Who Is a U.S. Citizen?

Questions

Who Is a U.S. Citizen?

The first part of the 14th Amendment to the U.S. Constitution defines citizens as people either "born or naturalized in the United States." It then describes that citizens are due certain protections and privileges under the law that no state government may take away.

A person can be a U.S. citizen at the time of birth through two main ways. The Latin term **Jus soli** (pronounced YOO SO-LEE) means "law of the soil."

▶

0:00

🔊

Jus soli (pronounced YOO SO-LEE)

People born in U.S. states or territories are citizens because they were born on U.S. soil. An exception to the jus soli rule would be the child of a foreign diplomat, as they are not considered subject to U.S. [jurisdiction](#), a requirement of jus soli. The Latin term **Jus sanguinis** (pronounced YOO SAN-GWIN-NISS) means "law of the blood."

▶

0:00

🔊

Jus sanguinis (pronounced YOO SAN-GWIN-NISS)

People born to at least one parent who is a U.S. citizen and has lived in the United States are citizens through their blood relationship to this parent. U.S. military and diplomatic sites in foreign countries are not considered U.S. soil, contrary to what many believe. The jus sanguinis rule covers children born to U.S. citizens living abroad, such as military families. Most U.S. citizen births, but not all, meet both the jus soli and jus sanguinis rules. The United States has laws to define special situations.

⌵

CONTINUE

⌵ ALL

Figure 48: Who is a U.S Citizen?

4.4 Flash

The screenshot displays the 'Effective Management' lesson interface. At the top, a navigation bar includes a title 'Effective Management' with an 'Edit path' link, and a series of icons for navigation and editing. Below this is a horizontal menu with tabs: 'Introduction' (checked), 'Functions of Effective Management' (selected), 'Example', 'Questions', and 'Summary'. The main content area is titled 'Functions of Effective Management' and features a Quizlet flashcard titled 'The Five Functions of Effective Management - Chapter 1'. The flashcard shows a progress bar with 'Remaining 37', 'Incorrect 0', and 'Correct 0'. The question text is 'Theory of human motivation proposed by Douglas McGregor that assumes people want to work, prefer autonomy, have underutilized talents, and have innate motivation.' Below the text is an input field and an 'Answer' button. At the bottom of the flashcard, there are buttons for 'Start Over', 'See Term first', and 'Speak text'. The Quizlet logo and 'View this study set' link are also present. A 'Choose a Study Mode' dropdown menu is located at the bottom right of the flashcard area. The bottom of the interface features a navigation bar with a dropdown menu, a 'NEXT' button, and an 'ALL' button.

Figure 49: Effective Management

4.5 File upload

Direct links to files of any type can be embedded in the lesson, providing the learner with a download of the file on click.

Path for Pathophysiology [Edit path](#)

Case Study Case Study Scenario Lab Results and Questions

Using your textbook and the articles by [Open file: Kibatchi et al \(2009\)](#) and by [Open file: Nyenwe and Kitabchi \(2011\)](#) that are included in this module, review this case study and answer the questions that follow.

192.168.201.50/RealiseITDev/Frameset/Data/DataPage.aspx/-1/misc/ki...

192.168.201.50/RealiseITDev/Frameset/Data/DataPage.aspx/-1/r

Reviews/Commentaries/ADA Statements

Hyperglycemic Crises in Adult Patients With Diabetes

ABBA E. KITABCHI, PhD, MD¹
GUILERMO E. UMPERREZ, MD²

JOHN M. MILES, MD³
JOSEPH N. FISHER, MD⁴

Diabetic ketoacidosis (DKA) and the hyperosmolar hyperglycemic state (HHS) are the two most serious acute metabolic complications of diabetes. DKA is responsible for more than 500,000 hospital days per year (1,2) at an estimated annual direct medical expense and indirect cost of 2.4 billion USD (4,3). Table 1 outlines the diagnostic criteria for DKA and HHS. The triad of uncontrolled hyperglycemia, metabolic acidosis, and increased total body ketone concentration characterizes DKA. HHS is characterized by severe hyperglycemia, hyperosmolality, and dehydration in the absence of significant ketoacidosis. These metabolic derangements result from the combination of absolute or relative insulin deficiency and an increase in counterregulatory hormones (glucagon, catecholamines, cortisol, and growth hormone). Most patients with DKA have autoimmune type 1 diabetes; however, patients with type 2 diabetes are also at risk during the catabolic stress of acute illness such as trauma, surgery, or infections. This consensus statement will outline precipitating factors and recommendations for the diagnosis, treatment, and prevention of DKA and HHS in adult subjects. It is based on a previous technical review (4) and more recently published peer-reviewed articles since 2001, which should be consulted for further information.

EPIDEMIOLOGY—Recent epidemiological studies indicate that hospitalizations for DKA in the U.S. are increasing. In the decade from 1990 to 2000, there was a 35% increase in the number of cases, with a total of 136,510 cases with a primary diagnosis of DKA in 2006—a rate of increase perhaps more

rapid than the overall increase in the diagnosis of diabetes (1). Most patients with DKA were between the ages of 18 and 44 years (56%) and 45 and 65 years (24%), with only 18% of patients <20 years of age. Two-thirds of DKA patients were considered to have type 1 diabetes and 34% to have type 2 diabetes; 50% were female, and 45% were nonwhite. DKA is the most common cause of death in children and adolescents with type 1 diabetes and accounts for half of all deaths in diabetic patients younger than 24 years of age (5,6). In adult subjects with DKA, the overall mortality is <1% (1); however, a mortality rate >5% has been reported in the elderly and in patients with concomitant life-threatening illnesses (7,8). Death in these conditions is rarely due to the metabolic complications of hyperglycemia or ketoacidosis but relates to the underlying precipitating illness (4,9). Mortality attributed to HHS is considerably higher than that attributed to DKA, with recent mortality rates of 5–20% (10,11). The prognosis of both conditions is substantially worsened at the extremes of age in the presence of coma, hypotension, and severe comorbidities (1,4,8,12,13).

PATHOGENESIS—The events leading to hyperglycemia and ketoacidosis are depicted in Fig. 1 (13). In DKA, reduced effective insulin concentrations and increased concentrations of counterregulatory hormones (catecholamines, cortisol, glucagon, and growth hormone) lead to hyperglycemia and ketosis. Hyperglycemia develops as a result of three processes: increased gluconeogenesis, accelerated glycogenolysis, and impaired

glucose utilization by peripheral tissues (12–17). This is magnified by transient insulin resistance due to the hormone imbalance itself as well as the elevated free fatty acid concentrations (4,18). The combination of insulin deficiency and increased counterregulatory hormones in DKA also leads to the release of free fatty acids into the circulation from adipose tissue (lipolysis) and to unrestrained hepatic fatty acid oxidation in the liver to ketone bodies (β -hydroxybutyrate and acetoacetate) (19), with resulting ketonemia and metabolic acidosis.

Increasing evidence indicates that the hyperglycemia in patients with hyperglycemic crises is associated with a severe inflammatory state characterized by an elevation of proinflammatory cytokines (tumor necrosis factor- α and interleukin- β , -6, and -8), C-reactive protein, reactive oxygen species, and lipid peroxidation, as well as cardiovascular risk factors, plasminogen activator inhibitor-1 and free fatty acids in the absence of obvious infection or cardiovascular pathology (20). All of these parameters return to near-normal values with insulin therapy and hydration within 24 h. The procoagulant and inflammatory states may be due to nonspecific phenomena of stress and may partially explain the association of hyperglycemic crises with a hypercoagulable state (21).

The pathogenesis of HHS is not as well understood as that of DKA, but a greater degree of dehydration (due to osmotic diuresis) and differences in insulin availability distinguish it from DKA (4,22). Although relative insulin deficiency is clearly present in HHS, endogenous insulin secretion (reflected by C-peptide levels) appears to be greater than in DKA, where it is negligible (Table 2). Insulin levels in HHS are inadequate to facilitate glucose utilization by insulin-sensitive tissues but adequate to prevent lipolysis and subsequent ketogenesis (12).

PRECIPITATING FACTORS—The most common precipitating factor in the development of DKA and HHS is infection (1,4,10). Other precipitating factors include discontinuation of or inadequate insulin therapy, pancreatitis, myocardial infarction, cerebrovascular accident, and

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Corresponding author: Abba E. Kitabchi, akkitabchi@utmem.edu.
An American Diabetes Association consensus statement represents the authors' collective analysis, evaluation, and opinion at the time of publication and does not represent official association opinion.
DOI: 10.2337/09-0032
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DIABETES CARE, VOLUME 32, NUMBER 7, JULY 2009 1335

NEXT ALL

Figure 50: Case Study

4.6 Widgets

4.6.1 Geometry widget

Based on the Cartesian plane, these widgets are drawn dynamically and represent variable values which are generated for the content. Animations can be included.



Figure 51: The Demand Curve - Animation

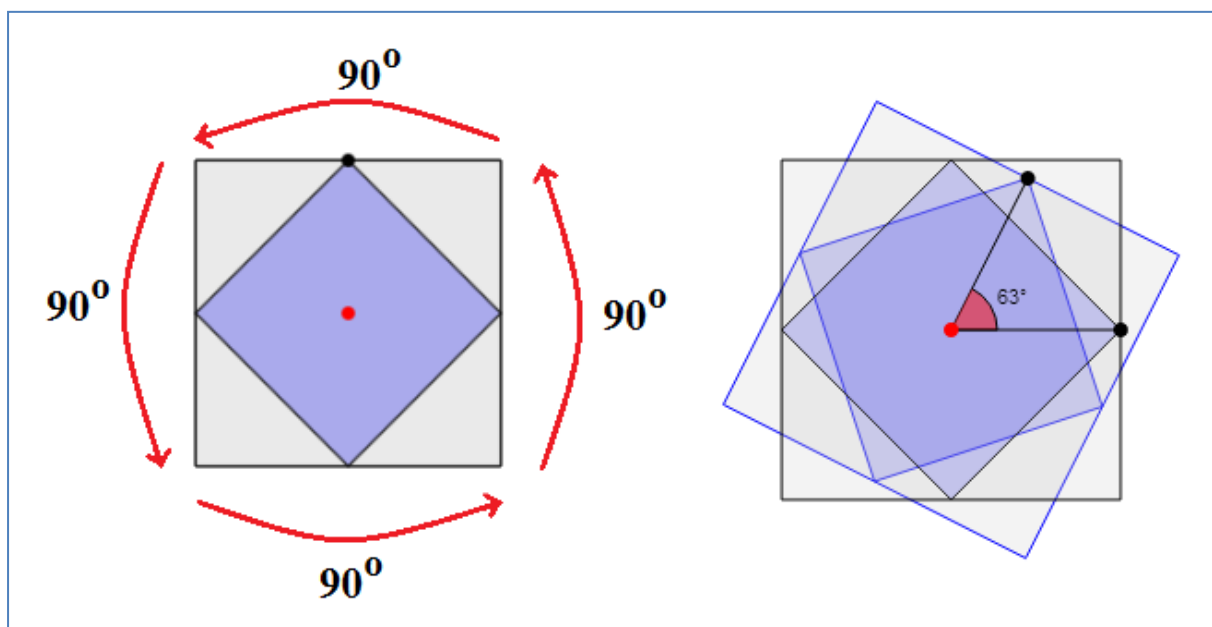


Figure 52: Rotational Symmetry – Animation

The learner can interact with the geometry widget, plotting points or shapes, and dragging points.

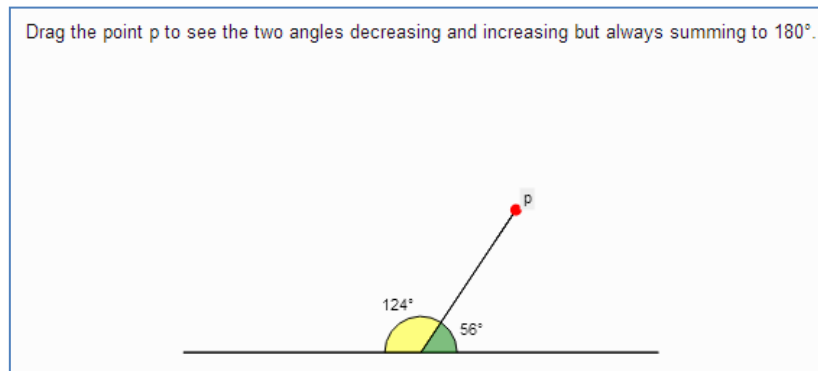


Figure 53: Supplementary Angles

4.6.2 Other widgets

Many other widgets are available covering arithmetic and statistics. Additional widgets can be created according to the Realizeit^{it} specification. Again, these are dynamically generated using variable values.

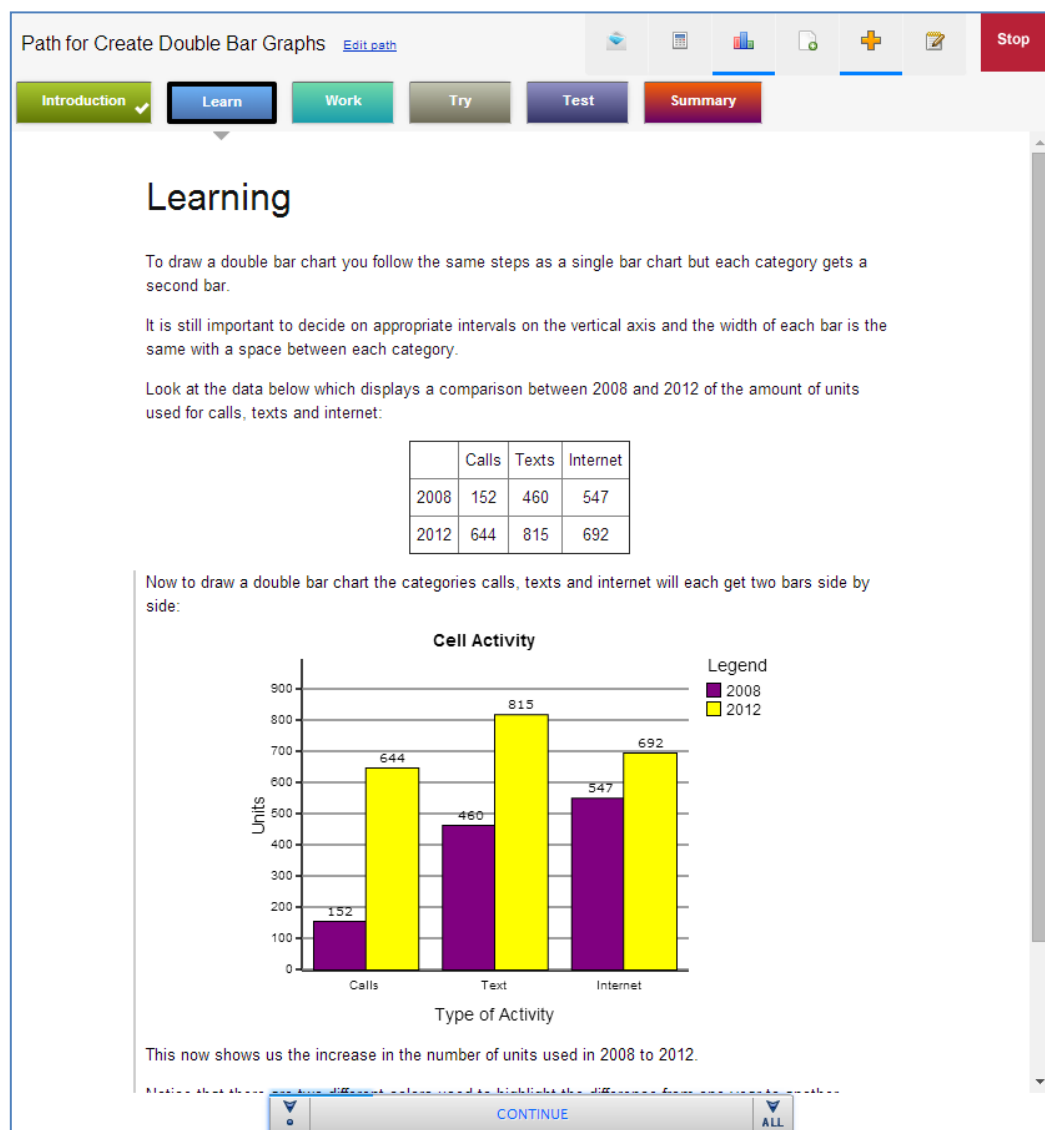


Figure 54: Bar Graph Widget - Iteration 1

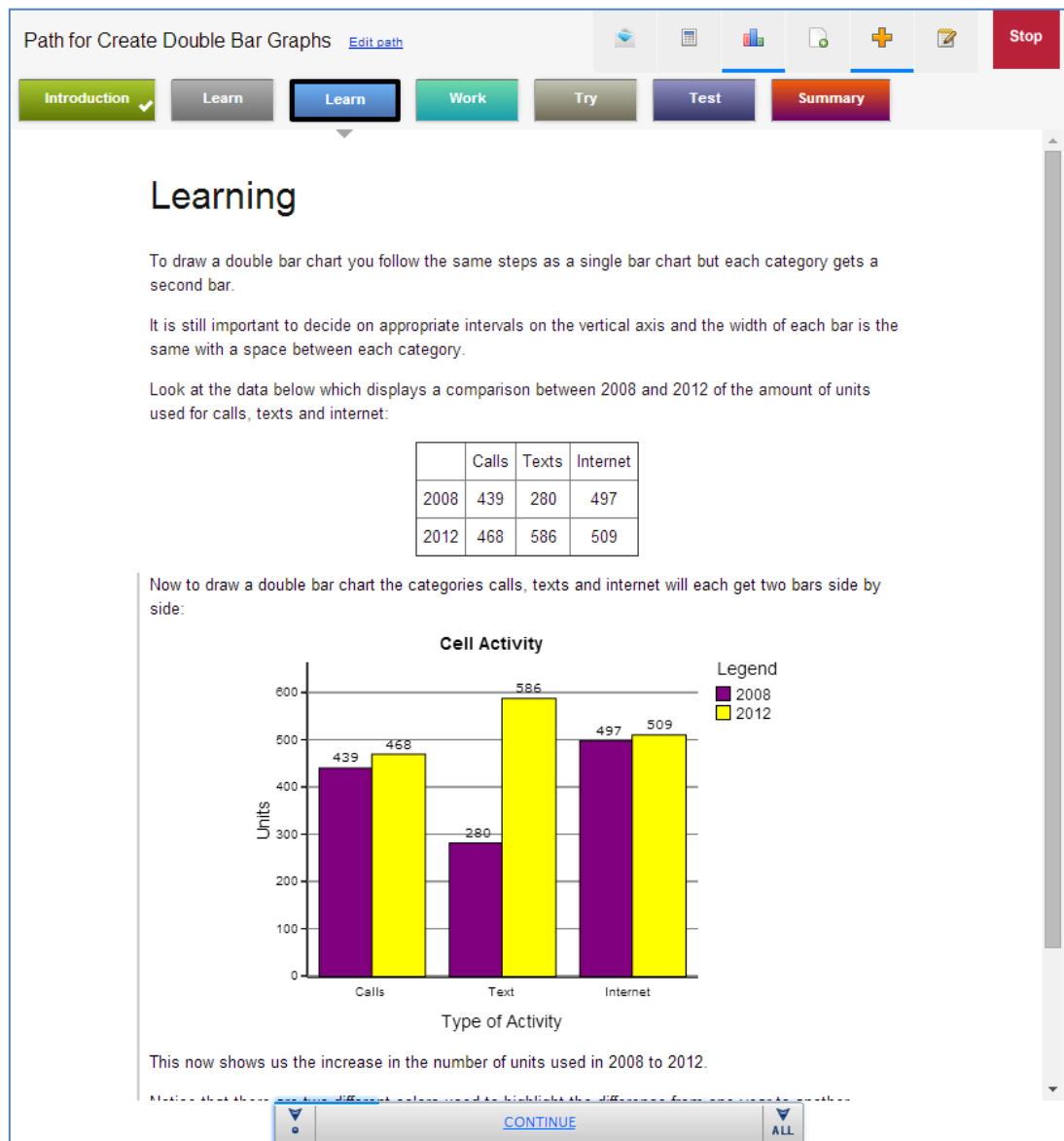


Figure 55: Bar Graph Widget - Iteration 2

4.7 Unity

Unity 3-d models can be embedded into the content. The learner can play within the model within the lesson or launch into full screen mode.

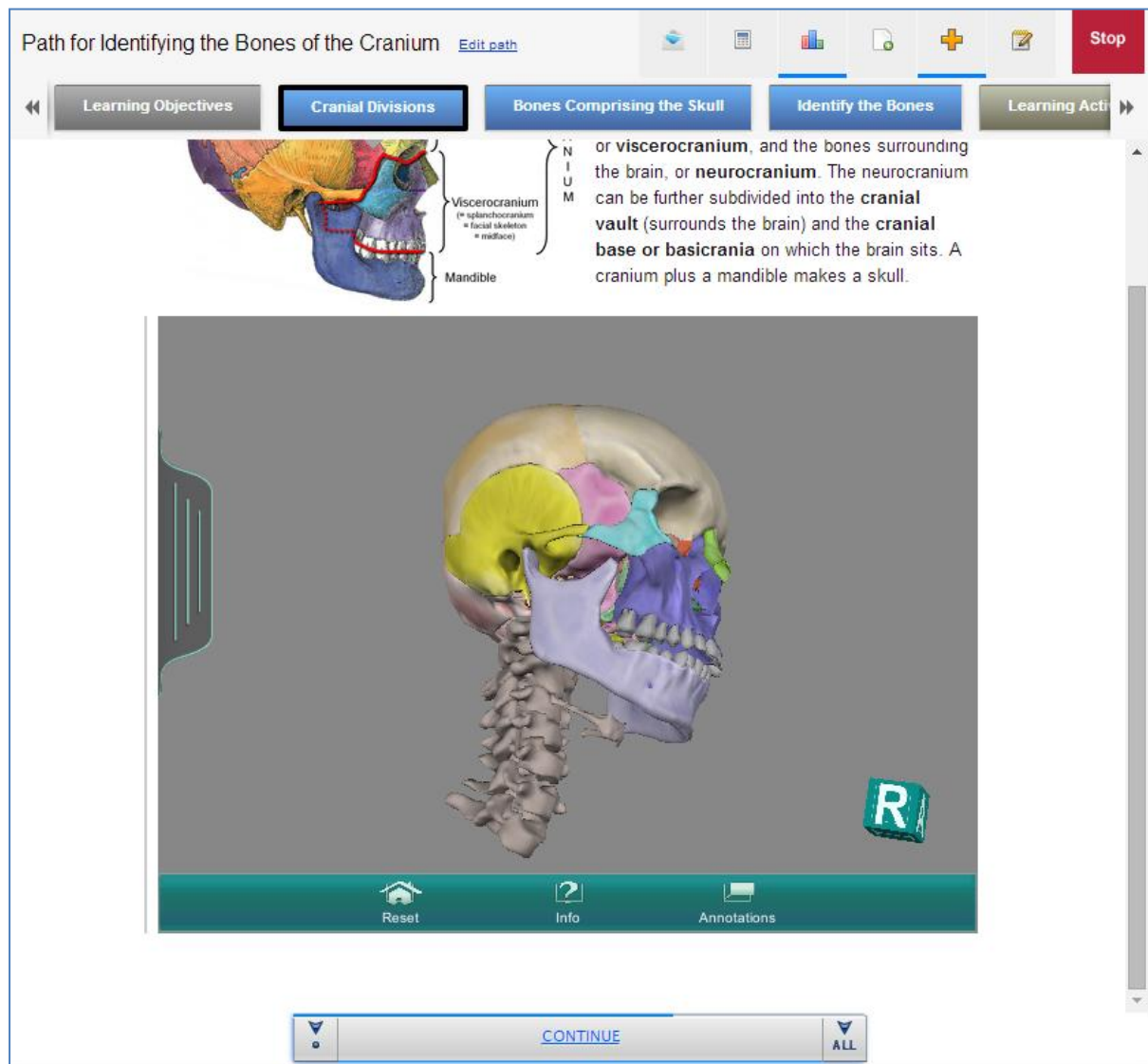


Figure 56: Identifying the Bones of the Cranium

4.8 Pop-ups

The learner can hover on a link to see additional detail in a pop-up window, on demand.

Path for Integer Ordering [Edit path](#)

Learn Work Try Test Summary

The temperature in Glasgow is negative, -7 , and the temperature in Plymouth is positive, 7 .


These are the temperatures in the table. Rank them in increasing order.

-14	-11	-7	-4	0	5	7
-----	-----	----	----	---	---	---

The correct order is -14, -11, -7, -4, 0, 5, 7.

Using a [map](#), Details

Leeds
London
Dundee
Glasgow
Birmingham
Aberdeen
Plymouth



CONTINUE

Check

Figure 57: Integer Ordering

4.9 Glossaries

Glossaries can be created to provide explanations for terms. The learner sees these explanations in a pop-up window, on demand.

Path for Dihybrid Crosses [Edit path](#)


Introduction Learn Work Test Summary

Introduction

Until now we have looked at Mendel's laws and monohybrid crosses. Now we need to consider a situation where we want to find out the [genotype](#) and characteristics (e.g. height and color) at the same

[Details](#)

The genetic make-up of an organism.



CONTINUE ALL

Figure 58: Dihybrid Crosses

4.10 References

References can be used in pop-up windows, or inline.

Path for Graphing the Sine Function [Edit path](#)

Learn Learn Work Try Test Summary

Learning

To draw the sine function, we have to find the coordinate one the curve.

Use the [trigonometric table](#) and the [4 quadrants on the unit circle](#), we can get:

x	y = sin(x)	x	y = sin(x)
0°	0		

[trigonometric table](#)

Deg	Sine	Cosine	Tangent	Deg	Sine	Cosine	Tangent
0	0	1	0	46	0.7193	0.6947	1.0355
1	0.0175	0.9998	0.0175	47	0.7314	0.682	1.0724
2	0.0349	0.9994	0.0349	48	0.7431	0.6691	1.1106
3	0.0523	0.9986	0.0524	49	0.7547	0.6561	1.1504
4	0.0698	0.9976	0.0699	50	0.766	0.6428	1.1918
5	0.0872	0.9962	0.0875	51	0.7771	0.6293	1.2349
6	0.1045	0.9945	0.1051	52	0.788	0.6157	1.2799
7	0.1219	0.9925	0.1228	53	0.7986	0.6018	1.327
8	0.1392	0.9903	0.1405	54	0.809	0.5878	1.3764
9	0.1564	0.9877	0.1584	55	0.8192	0.5736	1.4281
10	0.1736	0.9848	0.1763	56	0.829	0.5592	1.4826
11	0.1908	0.9816	0.1944	57	0.8387	0.5446	1.5399
12	0.2079	0.9781	0.2126	58	0.848	0.5299	1.6003
13	0.225	0.9744	0.2309	59	0.8572	0.515	1.6643
14	0.2419	0.9703	0.2493	60	0.866	0.5	1.7321
15	0.2588	0.9659	0.2679	61	0.8746	0.4848	1.804
16	0.2756	0.9613	0.2867	62	0.8829	0.4695	1.8807
17	0.2924	0.9563	0.3057	63	0.891	0.454	1.9626
18	0.309	0.9511	0.3214				

[4 quadrants on the unit circle](#)

1st quadrant: All positive (A+).

2nd quadrant: Sin is only positive (S+).

3rd quadrant: Tan is only positive (T+).

4th quadrant: Cos is only positive (C+).

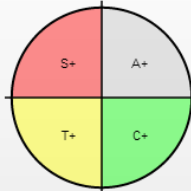


Figure 59: Graphing the Sine Function

4.11 Case studies

Learners can work through case studies composed of steps and questions. These can be supported by variables, so that the scenarios and responses change from one iteration to the next.

Path for Pathophysiology

Case Study

Case Study Scenario

Lab Results and Questions

Stop

Labs on admission to the ED are as follows:

CHEM panel		CBC		ABG	
glucose	888 mg/dL	WBC	16271	pH	7.16
Na ⁺	139 mEq/L	Hgb	11.4	CO ₂	30
K ⁺	3.4 mEq/L	HCT	35.1%	O ₂	96
Cl ⁻	90 mEq/L	neut	81.9%	HCO ₃	14
BUN	50 mg/dL	lymph	14%	Anion gap	34
Creatinine	1.92 mg/dL	Mono	4.1%		
BUN/Creatinine ratio	26	Eos	0.1%		

What electrolyte abnormalities are present? Check all that apply.

☐ hypernatremia
☐ hyponatremia
☐ hyperchlorinia
☐ hyperkalemia
☒ hypokalemia
☒ hypochlorinia

The patient is hypochloremic because Cl⁻ is 90 mEq/L which is less than 96 mEq/L.

What blood gas abnormality is present?

CONTINUE

ALL

Figure 60: Case Study - Iteration 1

Labs on admission to the ED are as follows:

<u>CHEM panel</u>		<u>CBC</u>		<u>ABG</u>	
glucose	762 mg/dL	WBC	16364	pH	7.24
Na ⁺	130 mEq/L	Hgb	12	CO ₂	28
K ⁺	5 mEq/L	HCT	34.8%	O ₂	90
Cl ⁻	90 mEq/L	neut	80.8%	HCO ₃	16
BUN	51 mg/dL	lymph	12.1%	Anion gap	34
Creatinine	1.97 mg/dL	Mono	4.8%		
BUN/Creatinine ratio	25.9	Eos	0.1%		

What electrolyte abnormalities are present? Check all that apply.

- ☐ hypokalemia
- ☐ hyperchloremia
- ☐ hyperkalemia
- ☒ hypochloremia
- ☐ hypernatremia
- ☒ hyponatremia

The patient is hypochloremic because Cl⁻ is 90 mEq/L which is less than 96 mEq/L.

The patient is hyponatremic because Na⁺ is 130 mEq/L which is less than 135 mEq/L.

What blood gas abnormality is present?

Figure 61: Case Study - Iteration 2

4.12 Links

Links to external content can be configured to open in a new tab or in a pop-up browser window.

Standard Financial Reporting

Overview
Learning Resources
Standard Financial Reporting

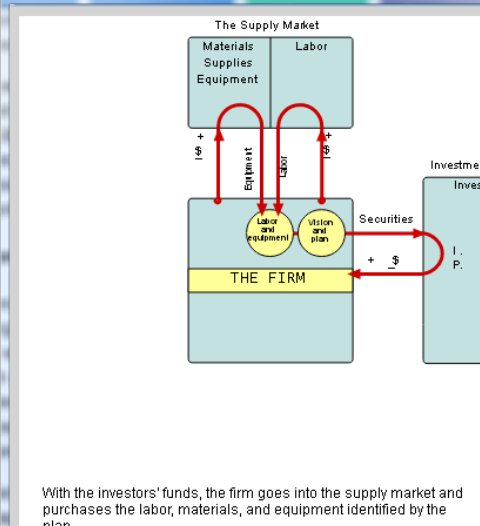
2. It disregards the timing difference and ignores the time value of money.

As we shall see later, both of these financial decision making and cannot share shareholder wealth goal does imply risk, and all the other factors that are considered in rational financial decision shareholder wealth is the superior principle.

The Firm and Its Financial Environment

Fundamental to understanding financial decision making is understanding how these basic interactions create the environment of the firm. This model will begin with the firm's transactions and the resulting consequences. If sustained profit generation is achieved, the firm's marketplace will consist of the following:

- the firm-the creator of value-added
- the investors-the source of capital
- the supply market-the source of materials, supplies, and equipment
- the labor market-the source of labor
- the customers-the purchasers of the firm's products
- the government-the controller of the firm's activities



The diagram illustrates the firm's interactions with its financial environment. At the center is 'THE FIRM', which is divided into 'Labor and equipment' and 'Vision and plan'. Above the firm is 'The Supply Market', which includes 'Materials, Supplies, Equipment' and 'Labor'. Below the firm is 'The Investment Market', which includes 'Investors'. Arrows show the flow of resources and capital: from the Supply Market to the Firm (Equipment, Labor, and Vision and plan), from the Firm to the Investment Market (Securities), and from the Investment Market back to the Firm (I. P.).

With the investors' funds, the firm goes into the supply market and purchases the labor, materials, and equipment identified by the plan.

Here are the firm's step-by-step activities that lead to the sustained generation of wealth.

Introduction to Financial Management

Figure 62: Standard Financial Reporting

4.13 Submissions

The learner can submit files of any type against a node, for the instructor's attention.

The screenshot shows the Realizeit learning platform interface. At the top, there's a navigation bar with 'Products', 'My learning', and 'My groups' tabs. A search bar is present with the text 'I want to learn...'. Below the navigation bar, a breadcrumb trail shows the path: 'Path for Identifying the Bones of the Cranium' > 'Identify the Bones'. The main content area is titled 'Bones Comprising the Skull' and includes a description: 'Using an exploding 3D model of the skull with each individual bone assigned a different color, count the number of individual bones. The colors of the bones should correspond to the color of the name of the bone in the learning material.' Below this, there's a section titled 'Identify the Bones' with instructions to print out a 'Skull template' and submit the labeled version. A 'CONTINUE' button is at the bottom of the main content area. On the right side, there's a sidebar with 'Lesson metrics' showing 'Lesson progress' (Correct/Incorrect bars) and 'Log' (Intro, Learning, Learning, Learning, IExample). Below the log, there's a 'Submissions' section with 'Add submissions' button and a message 'No work has been submitted for this item.' At the bottom of the sidebar, there's an 'Extras' section with 'Add extra information' button and links to Google and YouTube.

realizeit Products My learning My groups I want to learn...

Path for Identifying the Bones of the Cranium Edit path

Learning Objectives Cranial Divisions Bones Comprising the Skull Identify the Bones Learning Activities

Mandible Neurocranium Midface Basicrania Cranium

1 out of 1 (asking up to 1)

Bones Comprising the Skull

Using an exploding 3D model of the skull with each individual bone assigned a different color, count the number of individual bones. The colors of the bones should correspond to the color of the name of the bone in the learning material.

Identify the Bones

Print out the attached file entitled "Skull template", color code, and label the bones of the skull.

Open file: Skull template

Submit your labeled version on this node.

CONTINUE

Lesson metrics

Lesson progress

Correct

Incorrect

Before

Now

Ability

Ability

Log

Section	Correct	Activity
Intro	✓	
Learning	✓	
Learning	✓	
Learning	✓	
IExample		1 / 1

Submissions

Add submissions

No work has been submitted for this item.

Extras

All Section

Add extra information

Google YouTube

No extra information items has been associated with this item of knowledge.

Figure 63: Identifying the Bones of the Cranium