

Name: _____

AXIOM CHALLENGE

7th grade; Spring 2026

2 , 10 , _____ , 250 , 1250 , _____ 11 , 3 , -5 , -13 , -21 , _____ , _____ , _____
Common Ratio: _____ Common Difference: _____

Express the following as a^n :

$(-17)^8 \div (-17)^5$ = $\frac{(-2)^9}{(-2)^4} \div (-2)^3$ = $(-7)^5 \times (-7)^4 \times (-7)^9$ = $729 = (-3)^x$ x =	$\left(-\frac{1}{2}\right)^{-7} \div \left(-\frac{1}{2}\right)^6$ = $6^2 \div 6^{-4}$ = $9^{-17} \times 9^{-4} \times 9^{-25}$ = $128 = 2^x$ x = $-243 = -3^x$ x =
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$$\left|\frac{-d}{6} - 25\right| = 34$$

d =

$$\left|\frac{k+5}{2}\right| = 4$$

k =

Solve the inequalities and graph their solutions:

$$-112 \geq 8p(-2)$$

p _____

$$-18 \geq 5f + 27$$

f _____



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1) Determine the **GCF (greatest common factor)** of the following numbers:
{252, 336, 420}

2) Graph the equation and determine its intercepts in coordinate form:

$$y = -2x + 8$$

3) Daniel has \$200 in his account at Dedham Savings. The bank gives 4% interest per year. After one year, he withdraws \$50. **What is his remaining balance?**

\$_____.

4) Determine the **circumference** and **area** of a circle with radius **7 cm**.
Use $\pi = 22/7$.

Circumference = _____

Area = _____

5) Lily bought a notebook for **\$4.75**, pens for **\$3.40**, and a folder for **\$2.85**. The sales tax was **\$0.88**. She gave the cashier **\$15.00**. How much change should Lily receive?

\$_____.

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6) A fish tank is shaped like a rectangular prism. It has a length of 20 inches, a width of 6 inches, and a volume of 960 cubic inches.

What equation can you use to find the height, h ?

What is the height of the fish tank?

$h =$ _____

7) Look at this set of 6 numbers:

18, 24, 30, 36, 42, 48

How would the **mean** change if the number **24** were replaced by **42**?

8) A bag contains **5 red marbles, 3 blue marbles, and 4 green marbles**. You select one marble without looking and then put it back. If you do this **24 times**, what is the best prediction possible for the number of times you will pick a **blue marble**?

9) Jasmine has the following data:

9, 12, 14, 18, p

If the **mean** is **15**, what could p be?

$p =$ _____

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10) Complete the following statement using the two consecutive integers the number is between:

__ < $\sqrt{50}$ < __

11) Expand the expression:

$(3x - 5)^2$

_____.

12) Determine the LCM (least common multiple) of the following numbers:
 $\{14, 21, 35\}$

13) A ship sails 6 km East and then 8 km North. Find the ship's distance from its starting point in km.

14) Sofia has \$150 in her account. She spends 25% of her money, then deposits \$32, and later withdraws \$18. What is her final balance?

\$_____.

15) The ratio of triangles to circles in a design is 7:4. If there are 28 triangles, how many circles are there?

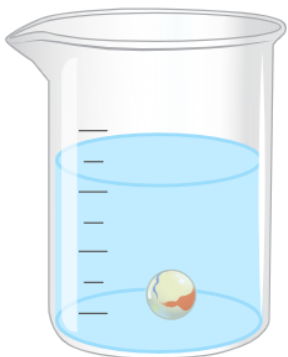
_____.

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- 1) Aisha places a glass marble into a beaker of water. This is what she observes:



Fill in the blanks:

The glass marble _____ the water because the glass marble is _____ dense than the water.

- a) Sinks in ... more
- b) Sinks in ... less
- c) Floats on the surface of ... more
- d) Floats on the surface of ... less

- 2) Circle whether the following substances are elementary substances or compounds based on their chemical compounds:

- a) **BCl₃ - (Boron trichloride)**

Elementary substance

Compound

- b) **C - (Graphite)**

Elementary substance

Compound

- c) **Br₂ - (Bromine)**

Elementary substance

Compound

- d) **He₃ - (Silicone)**

Elementary substance

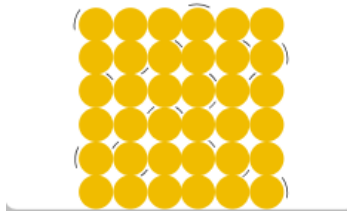
Compound

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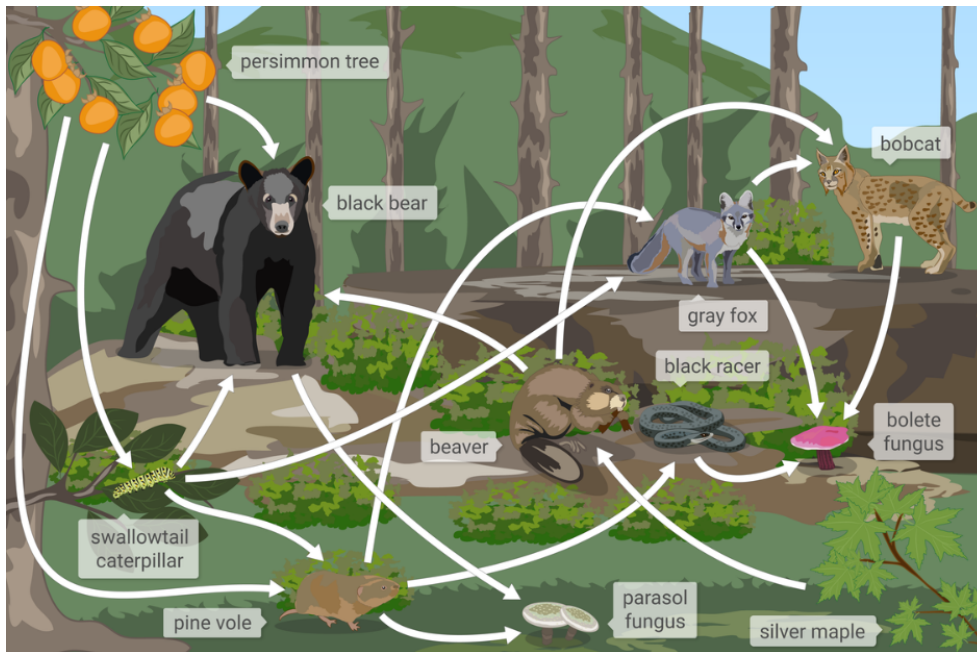
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3) Look at the following picture. Based on the particles of this substance, what state is the substance *most likely* to be?



- a) Solid
- b) Liquid
- c) Gas

4) Below is a food web from Shenandoah National Park, a forest ecosystem in Virginia.



Which two of the following organisms are primary consumers in this food web?

- a) Bobcat
- b) Silver maple
- c) Swallowtail caterpillar
- d) Beaver

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5) A magnet is held above some magnetic steel paper clips. **Complete the sentences to describe what can happen (and answer the questions below).** Assume the poles of the magnet and paper clip are opposite.

The magnet can make the paper clips move _____ them. The paper clips will _____ because they are _____ the magnet.

a) What is the first blank?

Only if it touches

Without touching

b) What is the second blank?

Stay still

Move to the side

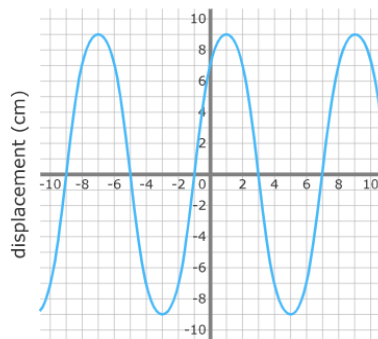
Move up

c) What is the third blank?

Repelled by

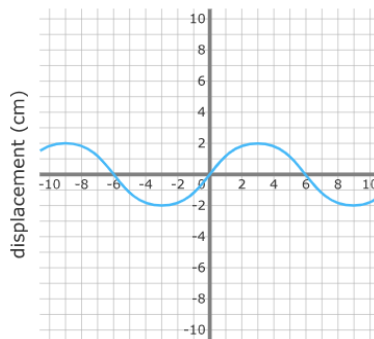
Attracted to

6) The graphs below represent two waves. The waves are traveling at the same speed through the same medium.



position (cm)

Wave 1



position (cm)

Wave 2

Compare the waves and circle the best option in the questions below.

a) Which amplitude of the waves is greater?

Wave 1

Wave 2

They are the same

b) Which frequency of the waves is less?

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Wave 1

Wave 2

They are the same

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7) Circle the better estimates below.

a) The temperature for a pot of boiling water.

100°C

100°F

b) The length of a long-distance running race.

18 yards

18 inches

18 feet

18 miles

c) The length of the Amazon River.

6,400 centimeters

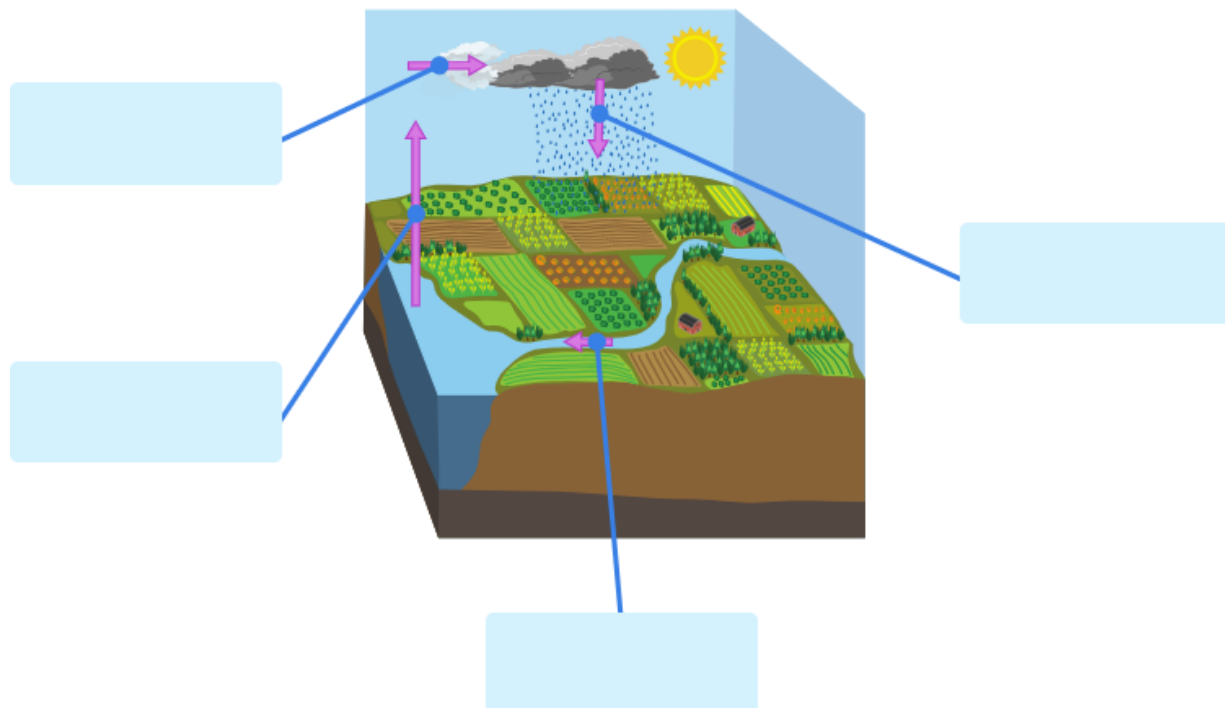
6,400 meters

6,400 kilometers

6,400 millimeters

8) Below is a diagram of the water cycle. Fill in the blanks using the word bank given.

Word Bank: Surface runoff, evaporation, condensation, precipitation.



9) Read the passage about a bike ride. Think about the kinetic energy of the person riding the bike. (Next page!)

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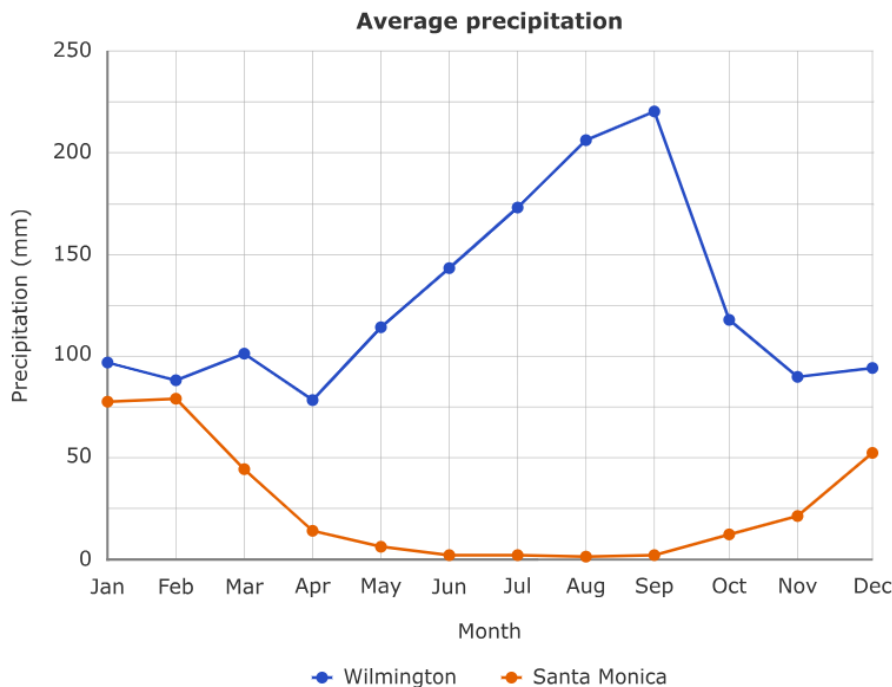
Passage:

Ellen was training for a bike race. One afternoon, she grabbed her helmet and took her bike out to the street. She got on the bike and started to pedal, pushing hard to start moving forward.

Which of the following is better evidence that Ellen's kinetic energy changed?

- a) When Ellen started pedalling her bike, she began moving across the street
- b) When Ellen got on her bike, her feet were no longer touching the ground

10) Wilmington, North Carolina, and Santa Monica, California, are two coastal cities in the United States. The graph below shows the average monthly precipitation totals for these two cities.



Based on the graph, circle the true statements.

- a) Wilmington receives more summer precipitation than Santa Monica
- b) Wilmington receives less precipitation during the summer than the winter
- c) Santa Monica receives less precipitation throughout the year than Wilmington
- d) Santa Monica receives almost no precipitation from June to September

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Instructions:

Imagine that you have all the everyday household materials (that a normal household would use) in your hands. Draw a rube goldberg machine that would accomplish a simple task (of your choosing) at the end:

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OPTIONAL Coding Problems (Receive Extra Credit)

Multiple Choice:

1) What does the middle mouse button do?

- a) Opens the start menu
- b) Opens a link in a new tab in web browsers
- c) Scrolls the desktop
- d) Deletes files

2) What is machine learning?

- a) A way AI (Artificial Intelligence) learns data
- b) A type of cooking robot
- c) A method to print books
- d) A new video game

3) What does AI do?

- a) Helps computers think or make decisions
- b) Makes coffee automatically
- c) Turns on your lights
- d) Types letters on its own

4) What is one common use of AI on the internet?

- a) Turns your computer screen on
- b) Recommending videos, ads, or search results
- c) Making your keyboard type automatically
- d) Controlling house lights without smart devices

5) What is one thing AI cannot do by itself?

- a) Recognize images
- b) Play music
- c) Translate languages
- d) Feel human emotions

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6) How does AI learn?

- a) By watching TV
- b) By reading your mind
- c) By analyzing data
- d) By sleeping

7) What is a variable in coding?

- a) A random number generator
- b) A type of mouse
- c) A storage for a value that can change
- d) A type of monitor

8) What does HTML do?

- a) Creates computer viruses
- b) Runs a program automatically
- c) Makes coffee
- d) Structures content on a webpage

9) What is the main loop in a Snake game?

- a) Playing music automatically
- b) Drawing pictures on the screen
- c) Typing code automatically
- d) Repeatedly checking for player input and updating the snake

10) What is the first index in most arrays?

- a) 0
- b) 1
- c) 2
- d) 3

11) What is a binary number system?

- a) A system using numbers 0–9
- b) A system using numbers 1–9
- c) A system using only 0 and 1
- d) A system using only letters

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OPTIONAL Essay Topics (Receive Extra Credit); Pick One Topic from the List to Write About **(All 300 Words or Under!)**:

Topic 1: What books, articles, podcasts, or documentaries have you most enjoyed in the past year, and why?

Topic 2: If you could teach a one-day course on something you know well, what would it be called and what would you teach? Why?

Topic 3: What is your greatest talent or skill, and how have you developed and demonstrated it over time? Be detailed about your involvement.