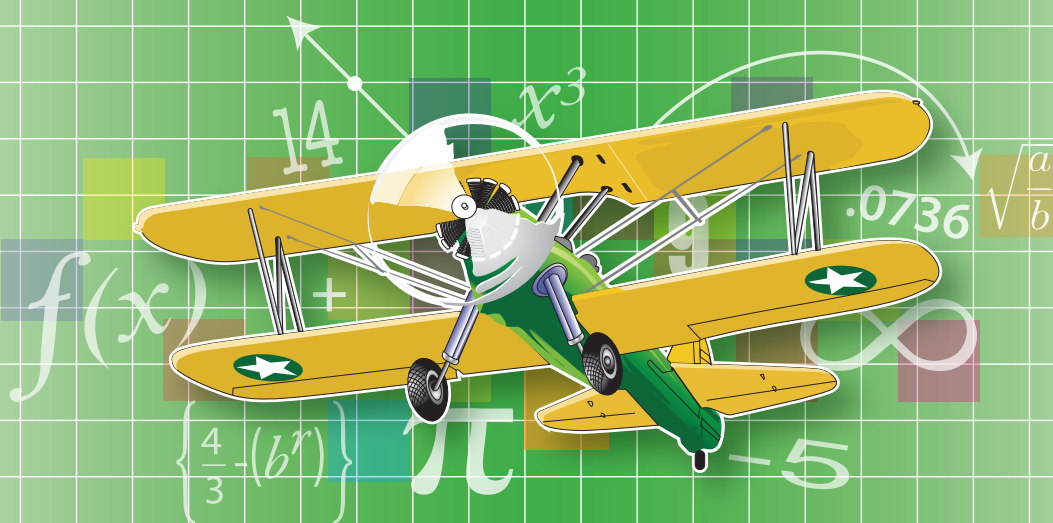


Algebra I & Mathematics I

Real Numbers

Pathways to Common Core Mathematics

Teacher Edition



Real Numbers
in
Real Situations



CENTER FOR
MATHEMATICS, SCIENCE,
AND TECHNOLOGY
Illinois State University

STEM

science, technology, engineering, mathematics

STEM

Science Technology Engineering Mathematics

Real Numbers

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COMMON CORE Standards

QUANTITIES

Reason quantitatively and use units to solve problems

N-Q 2 Define appropriate quantities for the purpose of descriptive modeling.

CREATING EQUATIONS

Create equations that describe numbers or relationships

A-CED 1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

INTERPRETING FUNCTIONS

Analyze functions using different representations

F-IF 7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

- A. Graph linear and quadratic functions and show intercepts, maxima, and minima.
- B. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
- C. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- D. (+) Graph rational functions, identifying zeros when suitable factorizations are available, and showing end behavior.
- E. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.

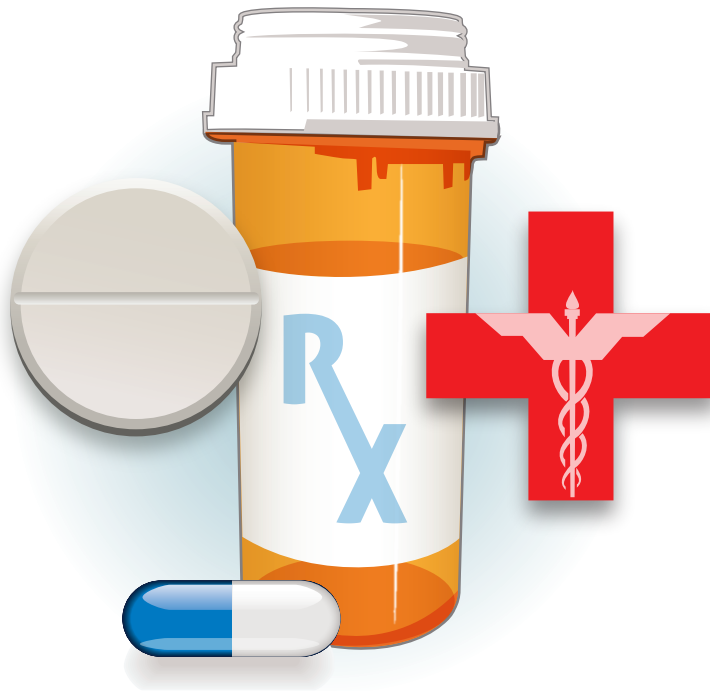
Standards for Math Practice

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
6. Attend to precision.
7. Look for and make use of structure.

Expressions and Equations

Medication Math

Teacher Edition



Illinois Pathway: Health Science

Objectives

- Identify independent and dependent variables in order to graph linear relationships.
- Create equations that describe numbers or relationships.

TRY IT



Students will be working in pairs and using spinners to create patients. Create spinners using the attached templates and make copies for each pair of students.

In groups of two, create a patient by spinning each of the Patient Characteristic Spinners- Age, Weight, and Illness. You and your partner's task is to treat your "patient" with the appropriate quantity of medication.

Amoxicillin is a common antibiotic used to treat a myriad of illnesses. Tablets come in two common amounts: 50 mg and 500 mg. Weight plays an important factor on the effectiveness of the medication.

- For a daily dose: 500 mg are given for the first 100 pounds and 50 mg are given for each additional 50 pounds.
- Remember: Amoxicillin comes in 500 mg tablets and 50 mg tablets.

Patients

Age	Weight	Illness	Total Dosage (mg)	Quantity of 50 mg Tablets	Quantity of 500 mg Tablets

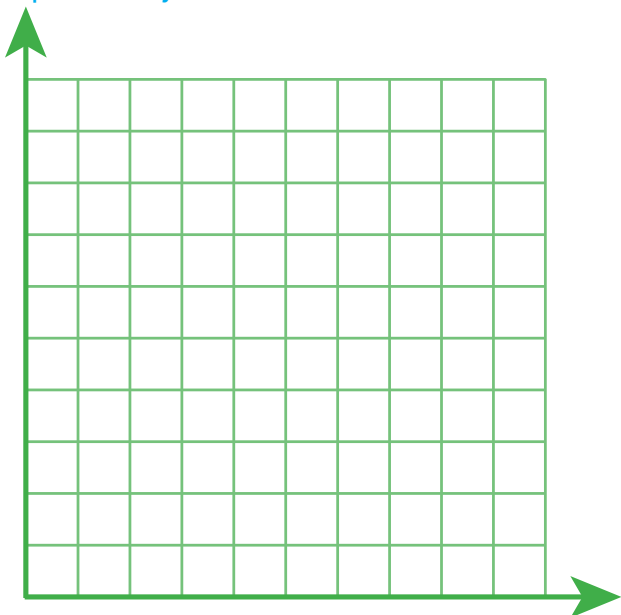
1 What Patient Characteristic is used to determine the correct dosage? **Weight**

2 Identify your independent and dependent variables.

Independent: Weight

Dependent: Dosage

- 3 Using your table, graph the relationship. Be sure to label your scale and axes.
Graphs will vary.



- 4 Using your table and graph, write a rule. Check your rule to be sure that your inputs and outputs match the table and graph values. Show your work.
 $x + 400 = y$, $x = \text{weight (lb)}$, $y = \text{dosage (mg)}$

DISCUSS IT



- 1 Explain the process your group took to come up with your rule.
Used table: looked for patterns
Used graph: noticed linear relationship, found slope
- 2 What did you do to check your rule with the table and graph?
Table: Plug-in weight from the table into the rule to check that the dosage (y) is the same as the calculated dosage from the table.
Graph: Check that the ordered pairs from the graph are the same as the corresponding weight (x) and dosage (y).
- 3 Why do you think the Patient Characteristic determined the correct dosage?
Extra Information to share with students: medication absorption rates are determined by weight due to higher concentrations stored in fat and slower metabolism

Optional Questions:

- 4 In Try It, the illness characteristic didn't play a role in the dosage. Does this mean that ALL illnesses can be treated with amoxicillin?
- 5 Do you notice any similarities between the illnesses on the spinner?
- 6 The flu is a virus, which typically cannot be treated with antibiotics. (Bacterial infections are treated with antibiotics.) However, many people are still prescribed amoxicillin when diagnosed with the flu. Why do you think that is?



APPLY IT



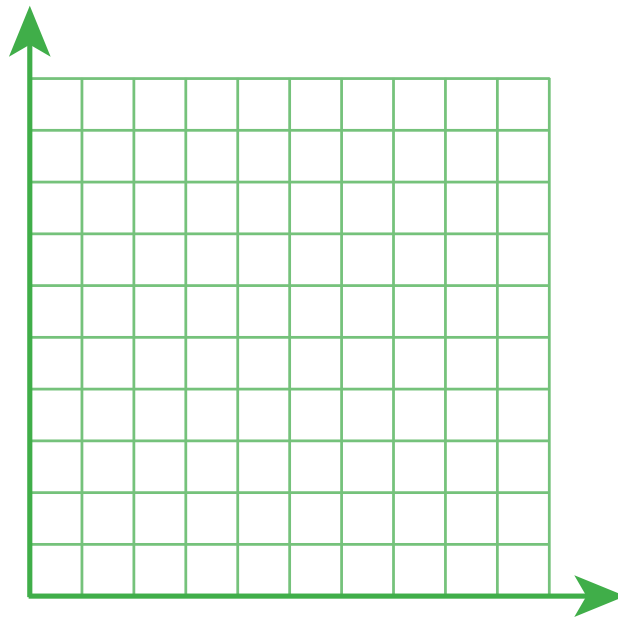
In 2004, there was a horrible earthquake in the Indian Ocean that caused a tsunami affecting 14 countries from Africa to Indonesia. The estimated death toll was over 230,000 people and there were about 125,000 people injured.

You and your partner have signed up to help children in need. You will be traveling to a clinic with injured children that need to be treated with a full regimen of Amoxicillin. A full treatment regimen consists of a daily dose of medicine for 10 days. However, since children metabolize the drug differently than adults, you will need to determine how much Amoxicillin to bring on your trip.

- For a daily Children’s Dose: 50 mg is given for the first 20 pounds and 25 mg is given for each additional 20 pounds.
- Remember: Amoxicillin comes in 500 mg tablets and 50 mg tablets.

1 Create a table, graph, and write a rule for the children’s daily dose of Amoxicillin. Check your rule to be sure that your inputs and outputs match the table and graph values. Show your work.

Weight (lb)	Dosage (mg)
20	50
40	50 + 25 = 75
60	50 + 25 + 25 = 100
80	50 + 25 + 25 + 25 = 125



For x : weight and y : dosage,

$$y = 50 + 25 \left(\frac{x-20}{20} \right)$$

$$y = 50 + \frac{5x-100}{4}$$

$$y = \frac{5}{4}x + 25$$

2 Using your rule, complete the table to determine the total daily dosage needed to treat your patients.

Name (Age)	Weight (pounds)	Illness	Total Dosage (mg)
Arti (6)	30	Ear Infection	62.5
Kade (9)	50	Flu	87.5
Kersen (13)	90	Strep Throat	137.5
Santoso (15)	100	Pneumonia	150

3 When you get to the clinic, there are 15 children to treat. Assuming children weigh no more than 100 pounds, how many tablets of Amoxicillin do you need to treat all 15 children for a full 10 day treatment regimen? Justify your answer.
 Assuming that children weigh no more than 100 pounds, you must bring three 50mg tablets per child per dose. Since a full regimen is 10 days, you must bring 30 tablets per child. Since there are 15 children to treat, you must bring 450 tablets

Student answers may vary. Check that students are justifying their reasoning for calculating each daily dose per child, and that students are accounting for a full treatment regimen (10 days) and all children to be treated (15 patients).

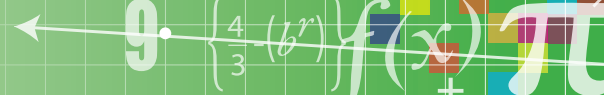
EXPAND IT



- 1 Explore what happens when an adult has a weight that is not divisible by 50 (i.e. 125 pounds, 275 pounds, etc.).
- 2 Assuming that you can only split tablets in half, how would you account for dosages that cannot be separated into 500mg or 50mg tablets?
- 3 Use the internet to explore the effects of under-dosing and over-dosing with medications. Use your research to justify the "standard" dose for medications (regardless of weight).

References and Resources:

Drug Info: http://www.ehow.com/about_5371299_amoxicillin-mg-information.html
 Drug Info: <http://www.drugs.com/dosage/amoxicillin.html>
 Spinners: <http://www.senteacher.org/Worksheet/34/SpinnerPrinter.xhtml>
 Tsunami Info: http://en.wikipedia.org/wiki/2004_Indian_ocean_earthquake



100 lb 150 lb
250 lb 200 lb

www.senteacher.org

15 25
45 35

www.senteacher.org

