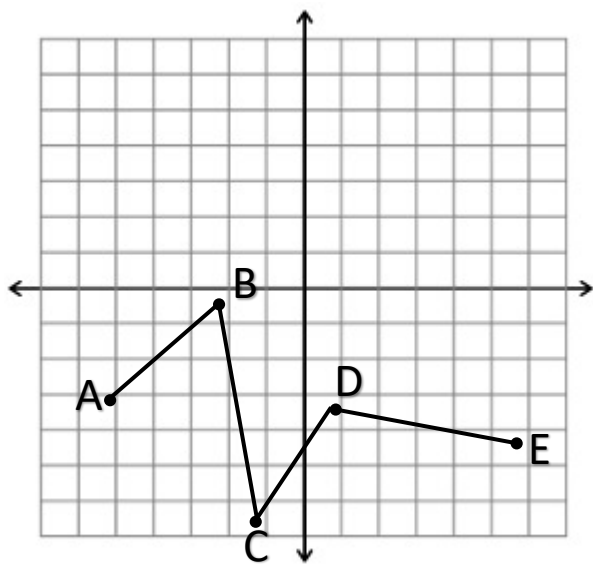


Depth of Knowledge

8.F.4 Use functions to model relationships between quantities. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values



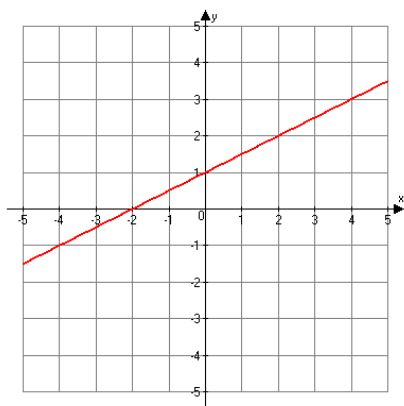
DOK Level: _____

Rationale:

Which line segment has the greatest positive rate of change?

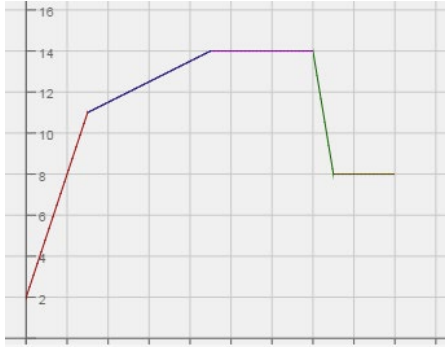
- A. \overline{AB}
- B. \overline{BC}
- C. \overline{CD}
- D. \overline{DE}

Use the graph below to find the slope of the line.



DOK Level: _____

Rationale:



Note: Y-axis should not be labeled or have scale.

DOK Level: _____

Rationale:

- A. Choose a scenario that could fit this graph.
- Relating money to time
 - Relating distance to time
 - Relating speed to time
 - Temperature to time

B. Using your chosen scenario provide a label and a scale for each of the axes.

C. Using your chosen scenario, labels, and scale write a story problem describing the graph.

8.EE.7.b Analyze and solve linear equations and pairs of simultaneous linear equations. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Solve for x .

$$4x - \frac{3}{4}(2x - 4) = \frac{1}{2}x + 1$$

- a. -1
- b. $5\frac{1}{5}$
- c. 2
- d. $\frac{2}{5}$

DOK Level: _____

Rationale:

Jaylen, Anna, Will, Maria, and Max solved the following equation:

$4x - \frac{3}{4}(2x - 4) = \frac{1}{2}x + 1$. Each student got a different equation after the first step. Which student(s) is correct?

- e. Jaylen: $16x - 3(8x - 16) = 2x + 4$
- f. Anna: $16x - 3(2x - 4) = 2x + 4$
- g. Will: $4x - \frac{6}{4}x - 3 = \frac{1}{2}x + 1$
- h. Maria: $-\frac{3}{4}(2x - 4) = 4\frac{1}{2}x + 1$
- i. Max: $4x - \frac{6}{4}x + 3 = \frac{1}{2}x + 1$

DOK Level: _____

Rationale:

Solve for x .

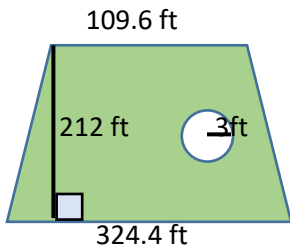
$$4x - \frac{3}{4}(2x - 4) = \frac{1}{2}x + 1$$

DOK Level: _____

Rationale:

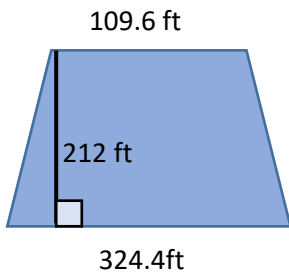
7.G.6 Solve real-life and mathematical problems involving angle measure, area, surface area, and volume. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

A park shaped like a trapezoid needs to be seeded with grass. There is a circular fountain inside the park. The fountain will not be seeded. Find the area of the park that needs to be seeded with grass.



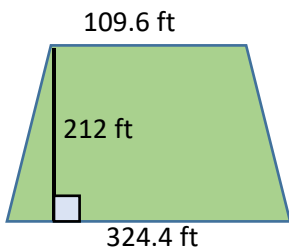
DOK Level: _____
Rationale:

You are contracted to design a fountain to be placed in a trapezoidal park. The park will have $45,975.74\text{ft}^2$ square feet of grass. The rest of the park is the space for the area of the fountain. Design a possible shape for your fountain. Determine the dimensions. Justify your solution.



DOK Level: _____
Rationale:

Find the area of the park shaped like a trapezoid.

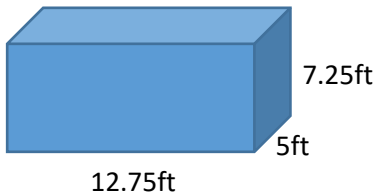


DOK Level: _____
Rationale:

6.G.2 Solve real-world and mathematical problems involving area, surface area, and volume.

Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l w h$ and $V = b h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

Find the volume of the box.



DOK Level: _____

Rationale:

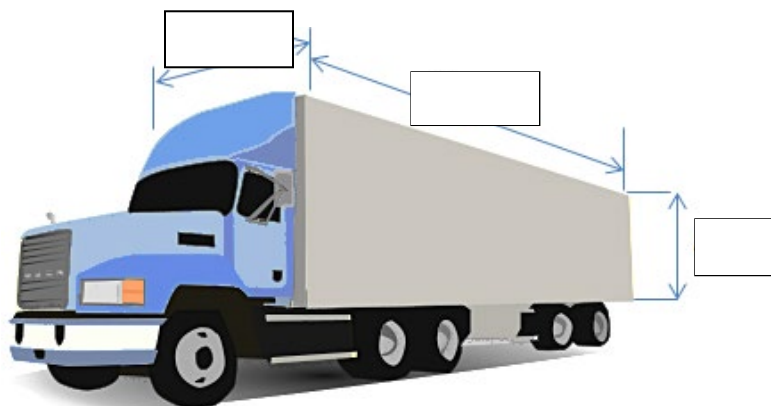
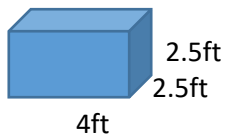
How many times larger is the volume of a box that measures 2.5ft by 2.5 ft by 4ft compared to a box that is 7ft by 12.5ft by 14ft?

DOK Level: _____

Rationale:

A truck needs to haul boxes in the shape of a rectangular prism where the edges of the box measure 2.5ft by 2.5ft by 4ft, and the cargo-hold of the truck measures 5ft by 7.25ft by 12.75ft. What is the greatest number of boxes that the truck can carry? Show your work or provide an explanation.

DOK Level: _____
Rationale:



6.NS.3 Compute fluently with multi-digit numbers and find common factors and multiples.

Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Which of the following expression(s) will have the same quotient as $38.01 \div 4.2$?

- A. $3.801 \div 0.42$
- B. $9.05 \div 4.2$
- C. $3801 \div 42$
- D. $3801 \div 420$
- E. $380.1 \div 42$
- F. $3.801 \div 42$
- G. $90.5 \div 42$

DOK Level: _____

Rationale:

Mrs. Hernandez wrote the following problem on the board for students to solve: $38.01 \div 4.2$. Three students chose different ways to solve the problem. Michelle didn't like decimals, so she rewrote the problem as $3801 \div 42$. Sean doesn't like decimals either, so he rewrote it as $3801 \div 420$. Laura doesn't mind a few decimals, so she rewrote it as $380.1 \div 42$.

- a. Is each student's thinking mathematically correct? Justify your answer.

DOK Level: _____

Rationale:

Solve. $38.01 \div 4.2$

DOK Level: _____

Rationale:

5.NF.4.a Apply and extend previous understandings of multiplication and division to multiply and divide fractions. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction. a. Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. For example, use a visual fraction model to show $(2/3) \times 4 = 8/3$, and create a story context for this equation. Do the same with $(2/3) \times (4/5) = 8/15$. (In general, $(a/b) \times (c/d) = ac/bd$.)

Three friends worked together to mow a lawn. Jack mowed $\frac{1}{3}$ of the lawn before lunch. After lunch Mike mowed $\frac{1}{4}$ of what was left. The next day Deja mowed the rest. Represent the problem in a visual fraction model. What fractional part of the lawn did Deja mow? How do you know you are correct?

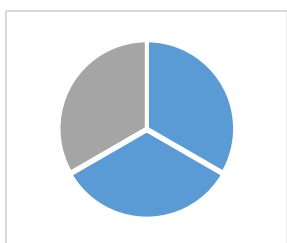
DOK Level: _____
Rationale:

Which situation(s) describe $\frac{3}{4} \times \frac{2}{3}$?

- a. Molly ate $\frac{3}{4}$ of $\frac{2}{3}$ of a cake.
- b. Jasmine had $\frac{3}{4}$ of a cup of flour and needed $\frac{2}{3}$ more to finish the recipe.
- c. A container of juice held $\frac{2}{3}$ of a liter. If Abby drank $\frac{3}{4}$ of the juice in the container, how many liters did she drink?
- d. Julian had $\frac{3}{4}$ yds of material. If a shirt took $\frac{2}{3}$ yd of fabric. How many shirts can he make?

DOK Level: _____
Rationale:

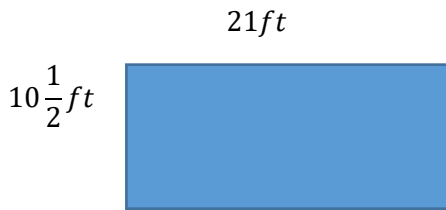
What is $\frac{3}{4}$ of $\frac{2}{3}$ of the cake?



DOK Level: _____
Rationale:

4.MD.3 Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. Apply the area and perimeter formulas for rectangles in real world and mathematical problems. For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.

What is the area of the rectangular floor?



DOK Level: _____

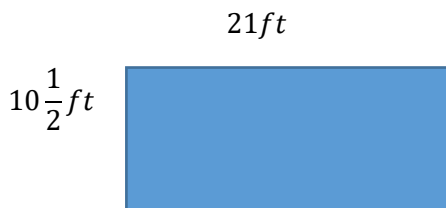
Rationale:

Fencing is bought in $3\frac{1}{2}ft$ panels. If 18 panels are used to fence a garden, what is a possible area of the garden?

DOK Level: _____

Rationale:

The Jones family has \$880 budgeted to purchase tile for their rectangular floor. If the tile they prefer costs \$4.00 per square foot, do they have enough budgeted? Explain your reasoning.



DOK Level: _____

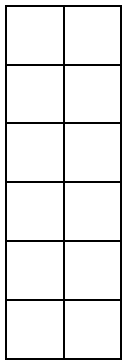
Rationale:

3.0A.5 Understand properties of multiplication and the relationship between multiplication and division. Apply properties of operations as strategies to multiply and divide. *Examples: If $6 \times 4 = 24$ is known, then $4 \times 6 = 24$ is also known. (Commutative property of multiplication.) $3 \times 5 \times 2$ can be found by $3 \times 5 = 15$, then $15 \times 2 = 30$, or by $5 \times 2 = 10$, then $3 \times 10 = 30$. (Associative property of multiplication.) Knowing that $8 \times 5 = 40$ and $8 \times 2 = 16$, one can find 8×7 as $8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56$. (Distributive property.)*

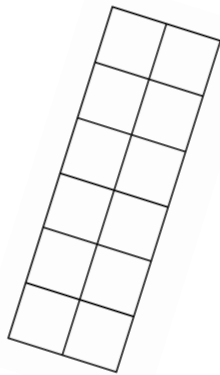
Commutative Property:

Select the three pictures that represent 2×6 .

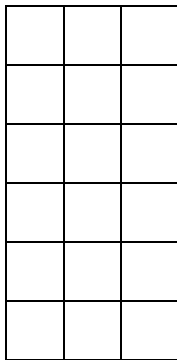
A.



B.



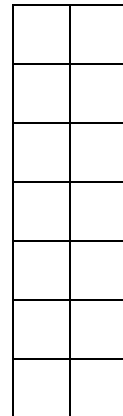
C.



D.



E.

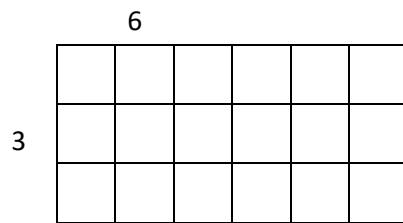
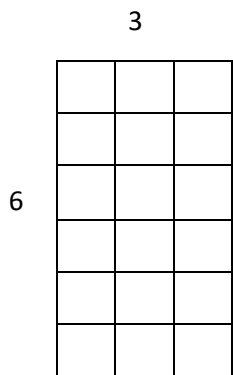


DOK Level: _____

Rationale:

Monica notices that Diagram A and Diagram B have the same area. She wonders if that works for all rectangles, so she draws a 4×5 rectangle and a 5×4 rectangle. She then tries several other rectangles such as a 2×3 rectangle and a 3×2 rectangle. Write a rule that would work for all rectangles.

DOK Level: _____
Rationale:



Fill in the blank.

$$4 \times 3 = 3 \times \square$$

DOK Level: _____
Rationale:

Distributive Property:

Finish the picture and fill in the blank.

$$7 \times 8 = 7 \times 5 + 7 \times \square$$

***** *****
***** *****
***** *****
***** = ***** +
***** *****
***** *****
***** *****

DOK Level: _____
Rationale:

Mrs. Wood had her students solve the problem 7×8 , and each student got the same answer, but did it differently.

- Monica turned the 8 to a 10, multiplied by 10×7 and then subtracted 14.
- Tyler multiplied 7×2 to get 14 and then added 14 four times.
- John multiplied 5×8 and then added it to 2×8 .

- a. Identify the answer.
b. Explain how each student was able to get the same answer even though they solved it differently.

DOK Level: _____
Rationale:

$$7 \times 8 = 7 \times \square + 7 \times \square$$

Enter a number in each box that make the equation true.

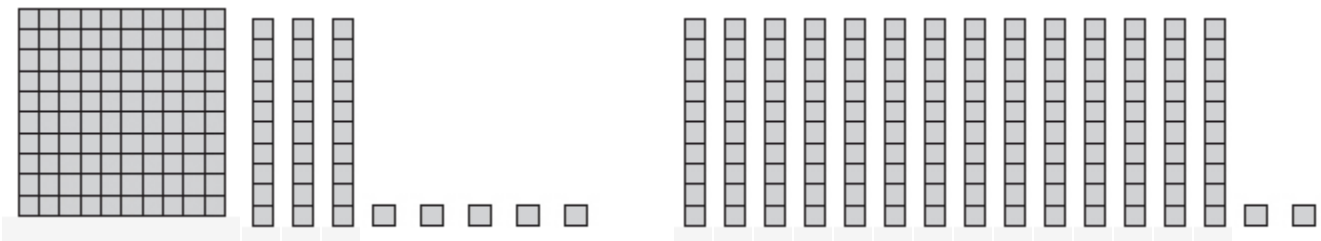
DOK Level: _____
Rationale:

2.NBT.4 Understand place value. Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using $>$, $=$, and $<$ symbols to record the results of comparisons.

Use base-ten blocks to compare 135 and 142. Use they symbols $<$, $>$, or $=$ to write a comparison statement.

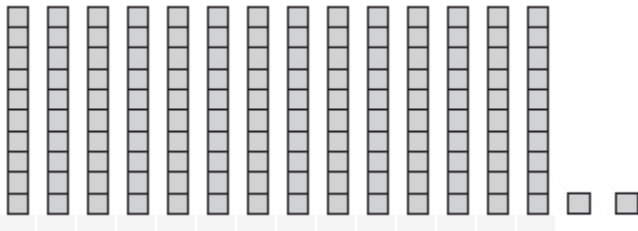
DOK Level: _____
Rationale:

Fill in the blanks by writing the numbers represented by models. Then circle the symbol $>$, $<$, or $=$ to correctly compare the numbers.



_____ $>$ _____
 _____ $<$ _____
 _____ $=$ _____

DOK Level: _____
Rationale:



- Write the number that is shown in the model.
- Replace the number in the tens place with a 0, and model the new number with base-ten blocks.
- Write a comparison statement using $<$, $>$, or $=$ to compare the original number with the new number.

$\underline{\hspace{2cm}} < \underline{\hspace{2cm}}$
 $\underline{\hspace{2cm}} > \underline{\hspace{2cm}}$
 $\underline{\hspace{2cm}} = \underline{\hspace{2cm}}$

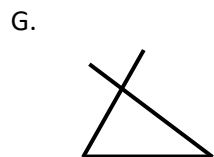
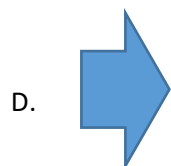
- Based on what you learned in part **a.**, how does 237 compare to 207?

DOK Level: _____

Rationale:

1.G.1 Reason with shapes and their attributes. Distinguish between defining attributes (e.g., triangles are closed and three sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

Identify which are triangles.



DOK Level: _____

Rationale:

Jaylen and Maria both drew shapes. Both said they were triangles. Who is correct? Explain your answer.

Jaylen



Maria



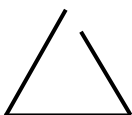
DOK Level: _____
Rationale:

Label each example triangle or not a triangle, and explain why.

A.



B.



C.



D.



DOK Level: _____
Rationale:

K.NBT.1 *Work with numbers 11-19 to gain a foundation for place value. Compose and decompose numbers from 11-19 into a group of ten ones and some further ones by using objects, and when appropriate, drawings or equations; understand that these two numbers are composed of a group of ten ones and one, two, three, four, five six, seven, eight, or nine ones.*

Show me the number 14 with counters.

DOK Level: _____

Rationale:

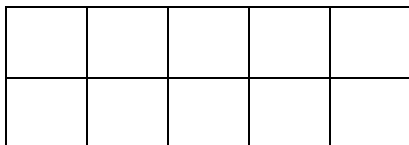
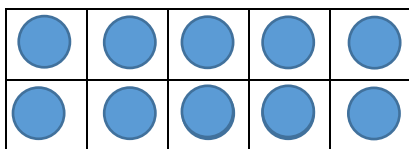
You have 2 ten-frames that have counters on them.
One is full and one is not.

- What is the largest number you could make? How do you know?
- What is the smallest number you could make? How do you know?

DOK Level: _____

Rationale:

How many more counters do I need to have 14?



DOK Level: _____

Rationale:

High School

N-RN.2 *Extend the properties of exponents to rational exponents. Rewrite expressions involving radicals and rational exponents using the properties of exponents.*

Three students, Luis, Mateo, and Camila, solved the equation: $\sqrt[3]{27^2} \cdot 9^{\frac{3}{2}} = 3^x$ using three different methods. Which student's method is correct? Select the step where the other two students made mistake. Justify your selection using mathematics.

Luis

- a. $\sqrt[3]{27^2} \cdot 9^{\frac{3}{2}} = 3^x$
- b. $\sqrt[3]{27^2} \cdot \sqrt{9^3} = 3^x$
- c. $\sqrt[5]{27^2 \cdot 9^3} = 3^x$
- d. $\sqrt[5]{(27 \cdot 9)^5} = 3^x$
- e. $\sqrt[5]{(3^3 \cdot 3^2)^5} = 3^x$
- f. $\sqrt[5]{(3^5)^5} = 3^x$
- g. $3^5 = 3^x$
- h. $x = 5$

Camila

- a. $\sqrt[3]{27^2} \cdot 9^{\frac{3}{2}} = 3^x$
- b. $\sqrt[3]{27^2} \cdot \sqrt{9^3} = 3^x$
- c. $27^{\frac{2}{3}} \cdot 9^{\frac{3}{2}} = 3^x$
- d. $(27 \cdot 9)^{\frac{2}{3} + \frac{3}{2}} = 3^x$
- e. $(3^3 \cdot 3^2)^{\frac{13}{6}} = 3^x$
- f. $(3^6)^{\frac{13}{6}} = 3^x$
- g. $3^{13} = 3^x$
- h. $x = 13$

Mateo

- a. $\sqrt[3]{27^2} \cdot 9^{\frac{3}{2}} = 3^x$
- b. $\sqrt[3]{27^2} \cdot \sqrt{9^3} = 3^x$
- c. $\sqrt[6]{27^4 \cdot 9^9} = 3^x$
- d. $\sqrt[6]{(3^3)^4 \cdot (3^2)^9} = 3^x$
- e. $\sqrt[6]{3^{12} \cdot 3^{18}} = 3^x$
- f. $\sqrt[6]{3^{30}} = 3^x$
- g. $3^{\frac{30}{6}} = 3^x$
- h. $x = 5$

DOK Level: _____

Rationale:

Find x.

$$\sqrt[3]{27^2} \cdot 9^{\frac{3}{2}} = 3^x$$

DOK Level: _____

Rationale:

Find x.

$$\sqrt[6]{3^{30}} = 3^x$$

DOK Level: _____

Rationale:

F-IF.4 Interpret functions that arise in applications in terms of the context. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.*

The function $f(t) = -16t^2 + 24t + 16$ represents the height of a ball above ground being thrown from a ladder, where t represents time in seconds and $f(t)$ represents height in meters.

- What is the initial distance of the ball above the ground?
- What is the maximum distance above the ground?
- How long was the ball in the air?
- What is the distance of the ball from the ground after 1 second?

DOK Level: _____
Rationale:

Identify the zeros of $f(t) = -16t^2 + 24t + 16$

DOK Level: _____
Rationale:

The function $f(t) = -16t^2 + 24t + 16$ represents a height, in meters, of a red ball above the ground after t seconds being thrown from a ladder. The function $g(t) = -16t^2 + 32t + 16$ represents a height, in meters, of a green ball above the ground after t seconds being thrown from the same ladder in the same direction.

- a. What is the distance between the two balls once they land?
- b. If both balls are thrown from the same height, use mathematics to explain why they land in different places?

DOK Level: _____
Rationale:

A-CED-2 Create equations that describe numbers or relationships. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

Terrance uses the investment plan that doubles the amount money in his account each day. If Terrance’s initial investment was \$5, write an equation representing this situation, where $f(t)$ is the amount of money Terrance has and t is the time in days. Fill in the blanks.

$$f(t) = 5 \left(\square^{\square} \right)$$

DOK Level: _____

Rationale:

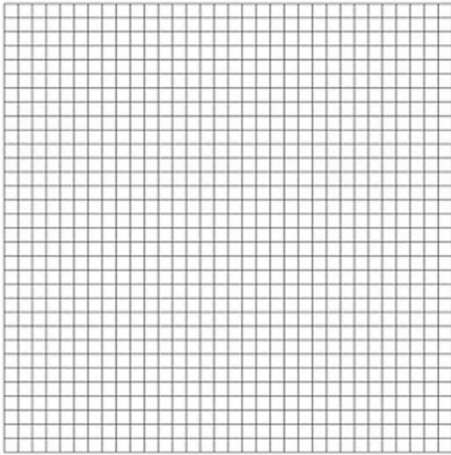
Terrance had two investment options. The first option would require Terrance to invest \$5 and the amount of money would double every day. The second option would require him to invest \$500 but it will double his money every other day. What factors should Terrance consider before he makes a decision?

- Write an equation to model each situation.
- Explain which opportunity would be the most profitable?

DOK Level: _____

Rationale:

Terrance uses the investment plan that doubles the amount money in his account each day. If Terrance's initial investment was \$5, write an equation representing this situation. Use the graph to illustrate it. Make sure to define your variables.



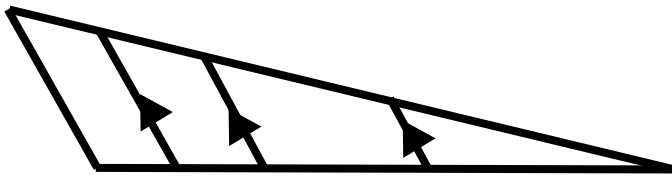
DOK Level: _____

Rationale:

G-SRT.6 Define trigonometric ratios and solve problems involving right triangles.

Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles

Explain why the cosine of A is the same regardless of which triangle is used to find it in the figure.



A

DOK Level: _____

Rationale:

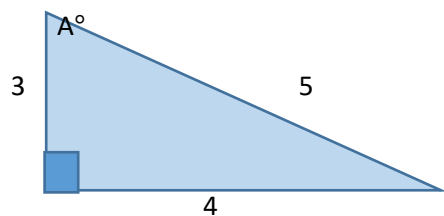
From <http://www.schools.utah.gov/CURR/mathsec/Core/Secondary-II/II5GSRT6.aspx>

From his balcony Reginald's line of sight is 30ft above High Street where he sees two of his friends. Jose is in front of the coffee shop directly east of him. Reginald's line of sight to Jose makes an 11° angle of depression. Directly west of him, Kiara is in front of the bookstore. Reginald's line of sight to Kiara makes a 15° angle of depression. How far away from each other are the two friends?

DOK Level: _____

Rationale:

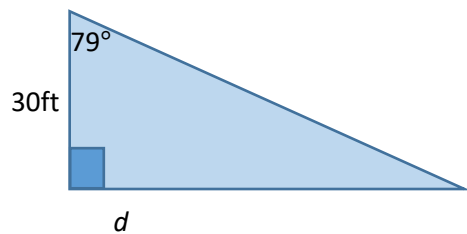
Given a right triangle ABC. What is the tangent of angle A?



DOK Level: _____

Rationale:

Given a right triangle ABC. What is the length of d ?

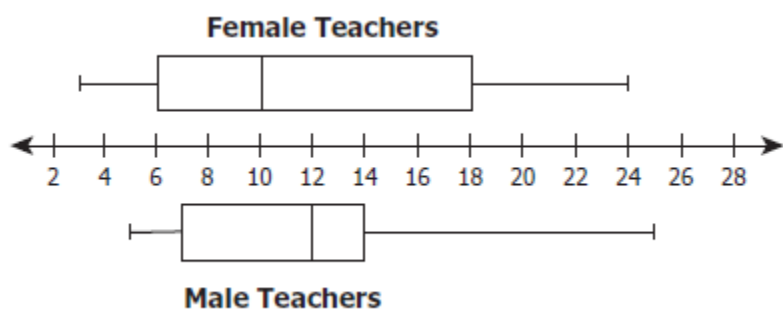


DOK Level: _____

Rationale:

S-ID.1 Summarize, represent, and interpret data on a single count or measurement variable.
Represent data with plots on the real number line (dot plots, histograms, and box plots).

The male and female teacher at Mountainview School recorded the number of years they have been teaching at the school. The box-and whiskers plots summarize the data.



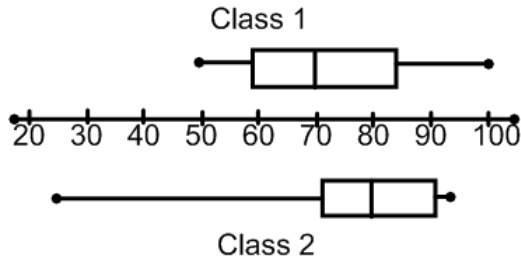
Identify which statements are false. Select all that apply.

- A. The range in the years teaching is greater for male teachers than for female teachers.
- B. The difference in the maximum number of years teaching for male and female teachers is 1.
- C. The median number of years teaching for female teachers is 2 less than the median for male teachers.
- D. More than half of all the teachers have taught at the school for more than 10 years.
- E. 25% of the teachers have taught 7 years or less.

DOK Level: _____
Rationale:

http://www.doe.virginia.gov/testing/sol/released_tests/2009/test09_eoc_algebra1_reduced.pdf

The number of quiz grades in 2 different Algebra classes is shown below.



DOK Level: _____

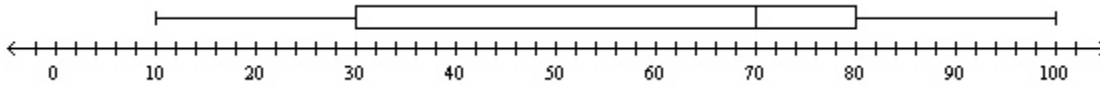
Rationale:

- Class 1 had 11 quizzes.
- Class 2 had 10 quizzes.

What is the total number of quizzes that earned a 70% or higher?

If class 1 had 10 quizzes and class 2 had 11 quizzes, could you find the answer? Explain.

What percent of the data shown in the box-and-whisker plot is located between 30 and 70?

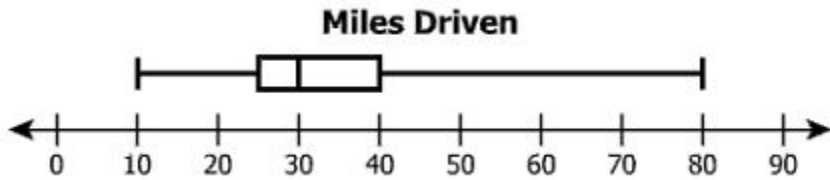


- A. 30
- B. 70
- C. 50
- D. 25

DOK Level: _____

Rationale:

Katie recorded the number of miles she drove for each of the 9 days. She drove a different number of miles each day. This box-and-whisker plot summarized her information.



Katie drove 30 miles on each of the two additional days. She redrew the box-and-whisker plot to include this data. Which statement must be true?

- A. The value of the range decreased.
- B. The value of the mean remained the same.
- C. The value of the median remained the same.
- D. The value of the interquartile range increased.

From: http://www.doe.virginia.gov/testing/sol/released_tests/2013/algebra_1_released_in_spring_2014.pdf

DOK Level: _____

Rationale:
