Algebra
Program 7 Guide

Each episode of *Go Figure?* can be used as an introduction or a "refresher" of basic mathematics concepts presented in a fun and creative way. It may be used in a classroom or an intervention setting. The accompanying CD-ROM edu-game was designed for use by students on an individual basis. The object of the edu-game is to solve a mystery. In order to do this, the student must solve mathematics problems in the specific content areas presented in the video series. Thus the digital video series is used to generate interest and enthusiasm in the presentation of mathematics concepts, and the CD-ROM allows students to practice using the concepts in a "video-game" format.

The three main characters in each DVD video program – the mysterious Pythagleo, plus two students named Carter and Chris who are trying to solve the mystery of Etna High School – discuss the targeted math concepts.

Chris, and to a lesser extent, Carter, verbalizes what each is thinking as they work through problems associated with the math concepts. The DVD programs assume that, like Chris and Carter, your students have already been introduced to the math concepts presented in the episode. The dialog may be too quick for some students. Every step that some of your students will need to solve similar problems on their own may not be mentioned in the programs. Therefore, pausing the DVD to review or present additional information will help adapt the learning situation to the needs of your students. See additional materials about teaching with videos and differentiated instruction in the Introduction of the Teacher Resources Guide.

Ohio Mathematics Content Standards and Benchmarks

Patterns, Functions and Algebra

B. Represent, ananlyze and generalize a variety of patterns and functions with tables, graphs, words and symbolic rules.
C. Use variables to create and solve equations and inequalities representing problem situations
F. Use representations, such as tables, graphs and equations, to model situations and to solve problems, especially those that involve linear relationships.
G. Write, simplify and evaluate algebraic expressions.
I. Explain how inverse operations are used to solve linear equeations.
L. Analyze functional relationships, and explain how a change in one quantitiy results in a change in the other.

Math Content

- Solving algebraic equations
- Chris explains how to find the numeric data in a word problem with the equation D = *r x t*. The problem gives the values of D (100 miles) and *r* (20 mph). Chris then explains how to isolate variable *t* and find its value.
- Letters can be used to stand in for unknown quantities.
- Trial and Error – Substitute a possible answer for a variable.

Episode Note

- Carter and Chris try to get information from the only person who did not disappear in 1966, the school principal. Pythagelo says he has the principal's phone number but he gives Chris and Carter only two of the digits. They must solve several algebraic equations to learn the missing numbers.

Teacher Notes

Some problem situations that can be solved using algebra.

- If a car travels at a speed of 20 miles per hour (mph), how long will it take to travel 100 miles?

  Distance = rate x time

  $D = rt$

  $100 = 20 \times t$ Replace the variables given data: 20 mph, 100 miles.

  $\frac{100}{20} = \frac{20t}{20}$ Isolate t.
  - Since t is multiplied by 20, divide by 20.
  - Remember to preform the same opertion on both sides of the equation.

  $5 = t$

  It will take a car 5 hours traveling at 20 mph to travel 100 miles.

- When evaluating expressions, replace the variable with the given value

  If $m = 3$, find the value of the expression $4m + 6$

  $4m + 6 =$
  $4(3) + 6 =$
  $12 + 6 = 18$

- If a problem appears to be too difficult to solve or evaluate, replace the given values in the equation with some possible value(s), and find which value(s) produces a *true* statement.

  Given that $46 = x^2 - 3$
  Find which value from the set [3, 4, 7] is the soution:

Try $x = 3$	Try $x = 4$	Try $x = 7$
$46 = x^2 - 3$	$46 = x^2 - 3$	$46 = x^2 - 3$
$46 = (3)^2 - 3$	$46 = (4)^2 - 3$	$46 = (7)^2 - 3$
$46 = 9 - 3$	$46 = 16 - 3$	$46 = 49 - 3$
$46 \neq 6$	$46 \neq 13$	$46 = 46$
False 3 is not the correct value.	False 4 is not the correct value	True This statement is true, therefore x = 7 is the solution to the equation $46 = x^2 - 3$

Algebra
Worksheet 1

Choice *E*, in multiple-choice questions, is always: *I request help from the teacher*.

You may mark E in addition to one other choice if you think that you have the right answer to the question but you do not feel that you have a complete understanding of the problem.

Your teacher will decide whether to use the two-point or four-point scoring rubric for problems that use numbers, pictures, or words to justify/explain your answer(s). You may request help for these questions, too. Write the word "teacher" by your answer(s).

1. Evaluate $5x + 3$ when $x = 2$.

   A. 25 B. 13 C. 10 D. 7 E. Teacher

2. Solve for y: $2(y+1) = 14$

   A. 7 B. –7 C. 6 D. $\frac{13}{2}$ E. Teacher

3. Solve for m: $3m \geq 117$

   A. $m < 39$ B. $m \geq 39$ C. $m \leq 39$ D. $m > 50$ E. Teacher

4. A sunflower grows at a rate of 4 in. per week. The sunflower was 6 in. tall when Chris brought it home from an experiment at school. The expression of the growth of the sunflower after the weeks (w) that Chris has the plant at home is $4w + 6$. What is the height of the plant after 4 weeks at Chris's house?

   A. 22 ft. B. 14 in. C. 1 ft. 10 in. D. 1 ft. 2 in. E. Teacher

5. What is the solution for $2(n+3) < 14$?

   A. $n < 4$ B. $n \geq 4$ C. $n < 5$ D. $n > 1$ E. Teacher

6. Which value below is a possible solution for $2(p+5) \leq 10$?

   A. $p = 1$ B. $p = 2$ C. $p = 0$ D. $p = 3$ E. Teacher

7. The perimeter of a rectangle can be found by using the formula $P = 2(L + W)$, where L represents the measure of the length and W represents the measure of the width (all in the same units). If the perimeter of the rectangle is 80 inches and the width is 5 inches, what is the length?

   A. 70 in. B. 14 in. C. 10 in. D. 35 in. E. Teacher

8. The formula to convert Celsius degree temperature to Fahrenheit degrees is $F = \frac{9}{5}C+32$. What Fahrenheit temperature is equivalent to 40ºC?

   A. 104º B. 32º C. 40º D. 100º E. Teacher

9. The formula for the area of a circle is $A = \pi r^2$. If the area of the circle is 78 sq. in., then the radius is estimated to be…

   A. 25 in. B. 24 in. C. 4 in. D. 5 in. E. Teacher

10. Which value below is a possible for solution for $5(m-4) < 10$?

    A. 6 B. 7 C. 5 D.10 E. Teacher

Algebra
Worksheet 2

Choice *E*, in multiple-choice questions, is always: *I request help from the teacher*.

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1. After Carter gave his ten closest friends the same amount of money, he still had $6.00 left. Which equation represents this problem if he originally had $36.00, where *m* is the amount of money given to each friend?

   A. $10m - 6 = 36$ B. $10m + 6 = 36$ C. $6m + 10 = 36$ D. $6m - 10 = 36$ E. Teacher

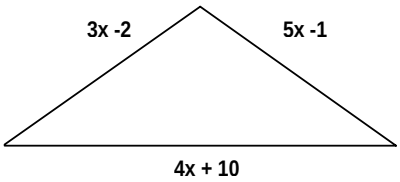
2. How much did Carter give his closest friends? (See Exercise #1)

   A. $20 B. $5 C. $12 D. $3 E. Teacher

3. Solve for x: $4x - 12 = 68$

   A. $x = 20$ B. $x = 19$ C. $x = 16$ D. $x = 10$ E. Teacher

4. Equations for each side of a triangle given at the right.
   Which expression represents the perimeter of the triangle?

   A. $12x + 13$
   B. $12x + 7$
   C. $4x + 11$
   D. $12x - 1$
   E. Teacher

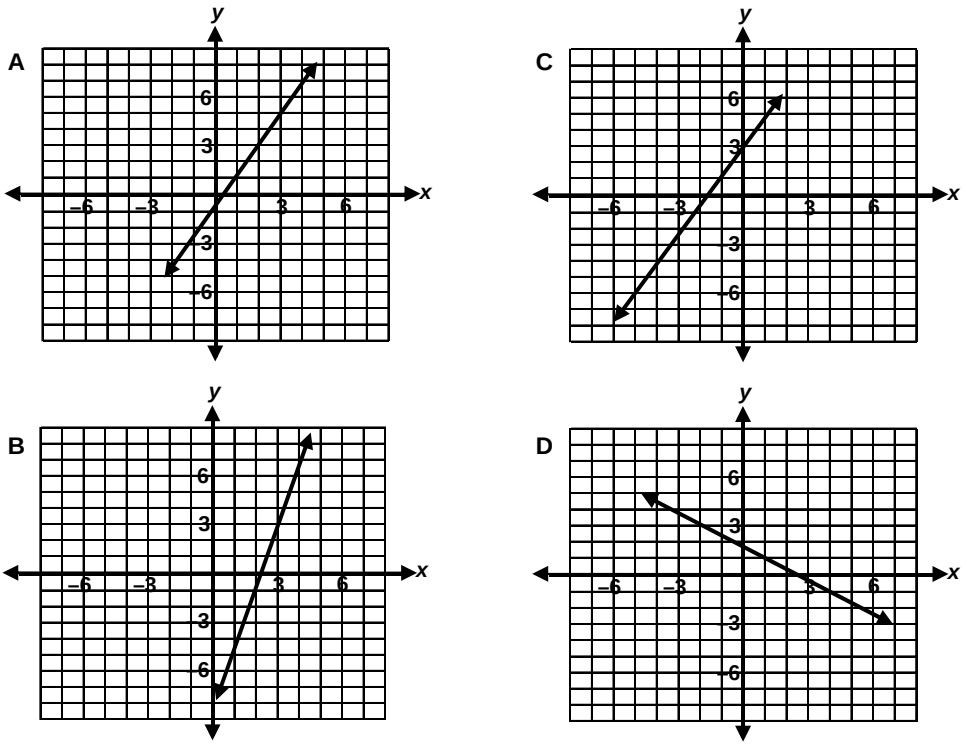
5. What is the value of *x* in exercise #4, if the perimeter is 31?

   A. 1 B. 3 C. 2 D. 4 E. Teacher

6. Vivian owns and operates Vivian's Vital Videos store. When Vivian figures out the price for a video, she adds the amount she pays her wholesale distributor for the video (***c***), and how much she needs to have per video to pay her staff, rent, utility bills and other overhead ($0.70 a video). Then she triples the result and sets that as the final price of one video (***p***). Which rule describes Vivian's calculations?

   A. $p = 3c + 3$ B. $p = 3(c + 0.7)$ C. $p = (.70 + 3)c$ D. $p = 3c + .70$ E. Teacher

7. Which graph represents y = 2x – 1?



8. Carter bought three pounds of deli-sliced roast beef and two pounds of salami. Each pound of roast beef costs $3.29. Carter spent a total of $17. There was no tax on the luncheon meats. Let *s* represent the cost of one pound of salami. Which equation is one way to represent this situation?

   A. $2s + 3(3.29) = 17$
   B. $2s + 3s = 17$
   C. $2s + 3s = 17s$
   D. $3s + 2(3.29) = 17$
   E. Teacher

9. Which expression is equivalent to $12a + 6b$

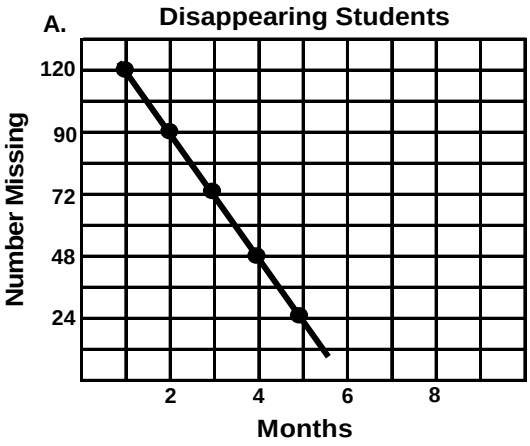
   A. $18ab$ B. $6^2(a + b)$ C. $6(2a + b)$ D. $6a + 12b$ E. Teacher

10. The relationship between x and y is $y = -3x + 4$. How does the value of y change when x increases from 0 to 4?

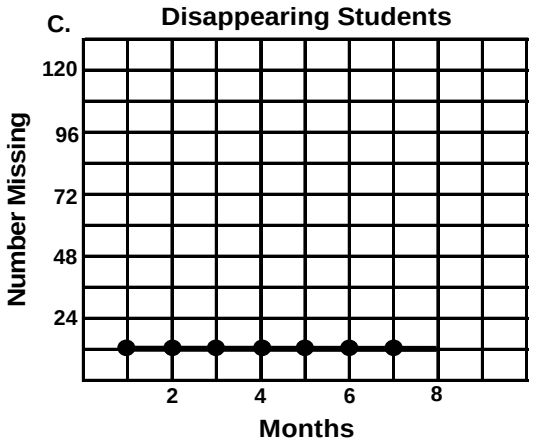
    A. y decreases by 4
    B. y decreases by 12
    C. y increases by 4
    D. y increases by 12
    E. Teacher

11. Carter thought that the Etna High students disappeared at a steady rate of 12 per month. Which chart shows how many disappeared for any number of months?

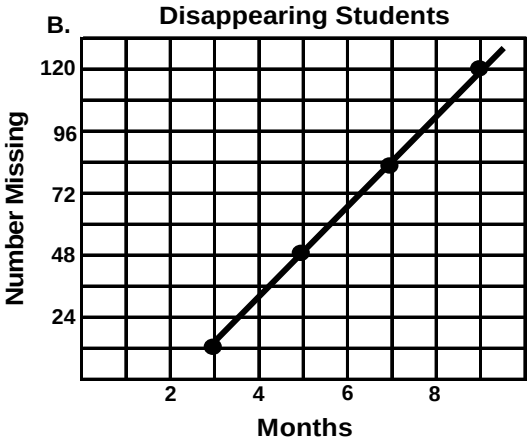
A.



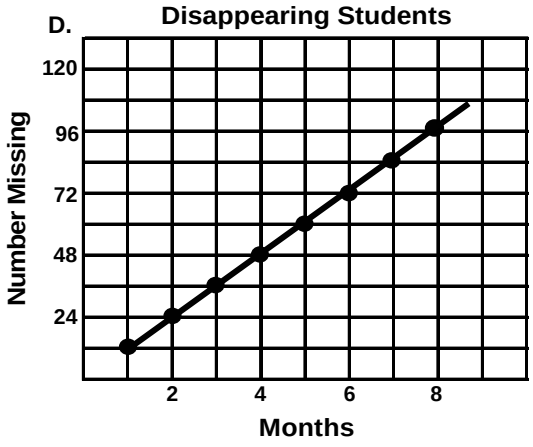
C.



B.



D.



E. Teacher

Algebra
Worksheet 3

Choice *E*, in multiple-choice questions, is always: *I request help from the teacher*.

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Your teacher will decide whether to use the two-point or four-point scoring rubric for problems that use numbers, pictures, or words to justify/explain your answer(s). You may request help for these questions, too. Write the word "teacher" by your answer(s).

1. Which problem situation is represented by the equation $12 + 3x = 72$?

    A. Carter had $72. He paid $12 for a snow shovel and spent the rest of the money to hire his brothers to shovel snow during three different show storms (x). How much money did Carter have left?
    B. Carter had $12. Then he earned money for each of three jobs shoveling snow. If Carter had a total of $72 dollars when he finished the jobs, how much did he charge (x) to shovel snow?
    C. Carter has $3. He earned $12 for 72 snow shoveling jobs. If x equals the cost of the snow shovel, how long did it take for Carter to make up the price of the snow shovel?
    D. Carter had $12. He earned $72 for 3 snow shoveling jobs. If x equals the time it took to complete each job, how long did it take Carter to complete all three jobs?
    E. Teacher

2. Pythagleo rented his neighbor's old car for several days at a fee of $20 a day. He also paid $35 for gasoline. All together he paid out $115. Write an equation that shows this situation. Use your equation to find the number of days Pythageo rented the car.

3. The mysterious person or persons who created mathematical problems for Chris and Carter to solve in order to learn more about the disappearance of 500 Etna High student and staff created a number pattern for them. The number pattern was 2913, 969, 321 105, 33… Which rule describes how to find the next term in the pattern?

    A. Divide the previous number by three and subtract 2.
    B. Multiply the previous number by three and add 2.
    C. Divide the previous number by three and add 2.
    D. Multiply the previous number by three and subtract 2.
    E. Teacher

4. Which expression is equivalent to $2x + 18$?

    A. $18 + x + 2$ B. $18 + x$ C. $18 \div 2 + x$ D. $2(x + 9)$ E. Teacher

5. Carter visited the candy dispensers in the shopping mall to get candy for his little brothers. He spent a roll of nickels valued at $2.00. Which equation represents how many nickels (n) Carter spent?

    A. $.05 \times n = \$2.00$
    B. $.05 \times \$2.00 = n$
    C. $.05 \div n = \$2.00$
    D. $\$2.00 \times n = .05$
    E. Teacher

6. Which equation represents the following sentence?

Seven times a number minus twelve is forty-four.

A. $7n + 12 = 44$
B. $44 - 12 = 7n$
C. $7n = 44 \div 12$
D. $7n - 12 = 44$
E. Teacher

7. If the input is 4, what is your output? What rule can help you find the output given the input? Use numbers, pictures, or words to explain your answers.

Input	Output
.02	1.4
.035	2.45
.56	39.2
1.25	87.5
4.0	?

8. Chris bought two packages of computer printing paper with 500 sheets of paper each. At the end of one month of printing on Chris's home computer, there were 214 sheets of paper left. Which equation could be used to find out how many sheets of paper Chris used that month? u = number of papers used.

A. $2 \bullet 214 + 500 = u$ B. $2u - 500 = 214$ C. $214u = 500–2$ D. $2 \bullet 500 - u = 214$ E. Teacher

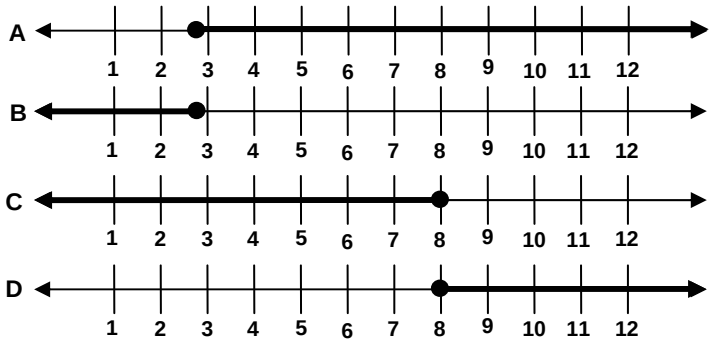
9. The Enigma, Ohio Special Olympics Track and Field Team was split into three groups, A, B, and C. All three groups ran laps to practice for the regional track meet. Group A ran twice as many laps as Group B. Group C ran half as many laps as Group B. Altogether Groups A, B, and C ran 28 laps each practice session. Which equation will help you determine the number of laps each team ran?

A. $.5(2B + B) = 28$
B. $.5(2B) + B + 2B = 28$
C. $2B + .5B = 28$
D. $2B + B + .5B = 28$
E. Teacher

10. The cost of song files downloaded from Chris's favorite Internet site increased by 9 cents a song. Chris downloaded 15 songs at the old price and 30 songs at the new price. Which expression could be used to determine the cost of all the song files Chris downloaded? s = old song file price.

A. $s(15 + 30 + .09)$ B. $15s + 30(s + .09)$ C. $.09(15 + 30) \div s$ D. $45s + .09$ E. Teacher

11. Which graph at the right represents values of x that will make the inequality $3x \geq 8$ true?



E. Teacher

Algebra

Answer Keys, Program 7: Worksheets 1 – 3

Each question on every worksheet offers the students the option of marking "Teacher" instead of or in conjunction with answering the question. The "Teacher" option is included to support student understanding and achievement. Students may have as much help and guidance as they need to understand concepts and master skills.

Instructors may decide whether to use the two or four point scoring rubric for constructed response problems (problems that use numbers, pictures, or words to justify/explain student answers). See the appendix for the complete rubrics.

Two-Point Scoring Rubric

2 – Complete
1 – Partial
0 – Inadequate

Four-Point Scoring Rubric

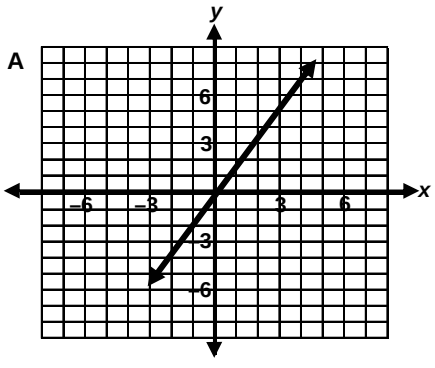
4 – Complete
3 – Clear
2 – Partial
1 – Minimal
0 - Inadequate

Worksheet 1

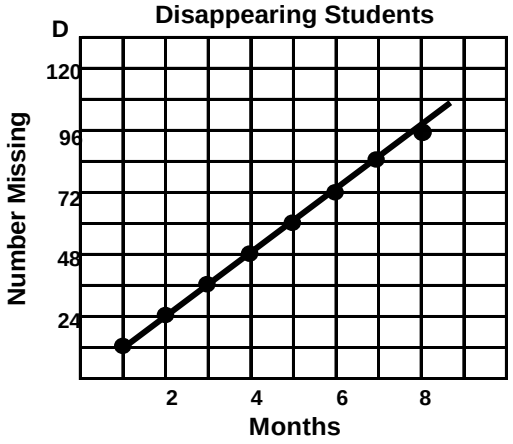
1. B. 13
2. C. 6
3. B. $m \geq 39$
4. C. 1 ft. 10 in.
5. A. $n < 4$
6. C. $p = 0$
7. D. 35 in.
8. A. 104°
9. D. 5 in.
10. C. 5

Worksheet 2

1. B. $10m + 6 = 36$
2. D. $3
3. A. $x = 20$
4. B. $12x + 7$
5. C. 2
6. B. $p = 3(c + 0.7)$
7. A.



8. A. $2s + 3(3.29) = 17$
9. C. $6(2a + b)$
10. B. y decreases by 12
11. D.



Worksheet 3

1. B. Carter had $12. Then he earned money for each of three jobs shoveling snow. If Carter had a total of $72 dollars when he finished the jobs, how much did he charge (x) to shovel snow?
2. $35 + 20d = 115$, 4 days. Answers should reflect the following. $115 – 35 = 80$ and $80 \div 20 = 4$.
3. A. Divide the previous number by three and subtract 2.
4. D. $2(x + 9)$
5. A. $.05 \times n = \$2.00$
6. D. $7n - 12 = 44$
7. Rule: Input $\times 70$ = Output; 280, Answers may reflect the following reasoning: 1**)** To go from output to the input, divide. $1.4 \div .02 = 70$. 2) Check the results with other inputs/outputs. The results are always the same Output $\div$ by Input = 70. Example: $87.5 \div 1.25 = 70$. 3) To get from the input to the output, do the opposite operation. 4 x 70 = 280.
8. D. $2 \bullet 500 – u = 214$
9. D. $2B + B + .5B = 28$
10. B. $15s + 30(s + .08)$
11. A.