1. An expression is shown below:

   $2\sqrt{21x}$

   Which value of x makes the expression equivalent to $12\sqrt{21}$?

2. An expression is shown below:

   $7\sqrt{35x}$

   Which value of x makes the expression equivalent to $14\sqrt{35}$?

3. An expression is shown below:

   $6\sqrt{57x}$

   Which value of x makes the expression equivalent to $42\sqrt{57}$?

4. An expression is shown below:

   $12\sqrt{82x}$

   Which value of x makes the expression equivalent to $36\sqrt{82}$?

5. Simplify: $3(2\sqrt{9})^{-3}$

6. Simplify: $4(2\sqrt{16})^{2}$

7. Simplify: $\frac{10^2(2\sqrt{25})^{-1}}{2}$

8. Simplify: $\frac{27(2\sqrt{9})^{-3}}{3}$

9. A polynomial expression is shown below.

   $(mx^3 + 2)(3x^2 + 2x + 5) – (24x^5 + 40x^3)$

   The expression is simplified to $16x^4 + 6x^2 + 4x + 10$. What is the value of m?

10. A polynomial expression is shown below.

    $(mx^3 + 3)(x^2 + 3x + 4) – (2x^5 + 8x^3 + 9x)$

    The expression is simplified to $6x^4 + 3x^2 + 12$. What is the value of m?

11. A polynomial expression is shown below.

    $(mx^3 + 4)(4x^2 + x + 2) – (3x^4 + 6x^3 + 16x^2)$

    The expression is simplified to $12x^5 + 4x + 8$. What is the value of m?

12. A polynomial expression is shown below.

$(mx^3 + 5)(x^2 + x + 5) – (6x^4 + 5x^2 + 25)$

The expression is simplified to $6x^5 + 30x^3 + 5x$. What is the value of m?

13. Factor the trinomial $x^2 – x – 12$?

14. Factor the trinomial $x^2 – 6x + 5$?

15. Factor the trinomial $x^2 + x – 6$?

16. Factor the trinomial $x^2 + 11x + 30$?

17. Simplify:

$$\frac{x^2 + 8x + 15}{x^2 + 7a + 10}; x \neq -5, -2$$

18. Simplify:

$$\frac{x^2 - 5x - 36}{x^2 + 8x + 16}; x \neq -4$$

19. Simplify:

$$\frac{x^2 - 9x + 14}{3x^2 - 12}; x \neq 2, -2$$

20. Simplify:

$$\frac{2x^3 + 8x^2}{5x^2 + 20x}; x \neq -4, 0$$

21. Anna burned 25 calories per minute running for x minutes and 5 calories per minute hiking for y minutes. She spent a total of 50 minutes running and hiking and burned 450 calories. The system of equations shown below can be used to determine how much time Anna spent on each exercise.

$25x + 5y = 450$

$x + y = 50$

What is the value of x, the minutes Anna spent running?

22. A shipment of computer monitors, some weighing 25lb and the other weighing 40lb each, has a total weight of 680lb. If there are 20 monitors altogether, how many weigh 40lb (y)?

    $25x + 40y = 680$
    $x + y = 20$

23. A group of students goes out to lunch. If two have burritos and five have tacos, the bill will be $19.50. If five have burritos and 2 have tacos, the bill will be $22.50. Find the price of the burrito, x.

    $2x + 5y = 19.50$
    $5x + 2y = 22.50$

24. A geometry teacher has a set of 60 plastic pentagons and octagons. She happened to notice that all the figures together have a total of 354 sides. How many pentagons, x, does the teacher have?

    $5x + 8y = 354$
    $X + y = 60$

25. Samantha and Maria purchased flowers. Samantha purchased 5 roses for x dollars each and 4 daisies for y dollars each and spent $41 on the flowers. Maria purchased 1 rose for x dollars each and 6 daisies for y dollars each and spent $29. The system of equations shown below represents this situation.

    $5x + 4y = 41$
    $x + 6y = 29$

    How much did each rose cost?

26. A baseball team had $1,500 to spend on supplies. The team spent $285 on a new bat. New baseballs cost $6 each. The inequality $285 + 6b \leq 1{,}500$ can be used to determine the number of new baseballs (b) that the team can purchase. What is the maximum number of baseballs that can be purchased?

27. Canyu Canoe Co. rents canoes for $8 plus $3 per hour or any part of an hour. For how many hours can you rent a canoe if you want to spend no more than $25? Use the inequality $3x + 8 \leq 25$ to determine the answer.

28. Suppose you are a salesperson for Glitz 'n Glitter. Each month you earn $450 plus one-eighth of your sales. What amount must you sell this month to earn more than $2000? Use the inequality $450 + \frac{1}{8}x > 2000$ to find the answer.

29. Tyreke always leaves a tip of between 6% and 15% for the server when he pays for his dinner. This can be represented by the system of inequalities shown below, where y is the amount of tip and x is the cost of dinner.

    $y > 0.06x$

    $y < 0.15x$

    What is the minimum and maximum tip Tyreke will leave if his bill is $35?

30. Tyreke always leaves a tip of between 15% and 25% for the server when he pays for his dinner. This can be represented by the system of inequalities shown below, where y is the amount of tip and x is the cost of dinner.

    $y > 0.15x$

    $y < 0.25x$

    What is the minimum and maximum tip Tyreke will leave if his bill is $50?

31. Tyreke always leaves a tip of between 10% and 20% for the server when he pays for his dinner. This can be represented by the system of inequalities shown below, where y is the amount of tip and x is the cost of dinner.

    $y > 0.1x$

    $y < 0.2x$

    Would $5.50 be an acceptable tip if his bill was $45?

Algebra 1 Keystone Open-ended questions

1. Keng creates a painting on a rectangular canvas with a width that is four inches longer than the height, as shown in the diagram below.

A. Write a polynomial expression, in simplified form, that represents the area of the canvas.

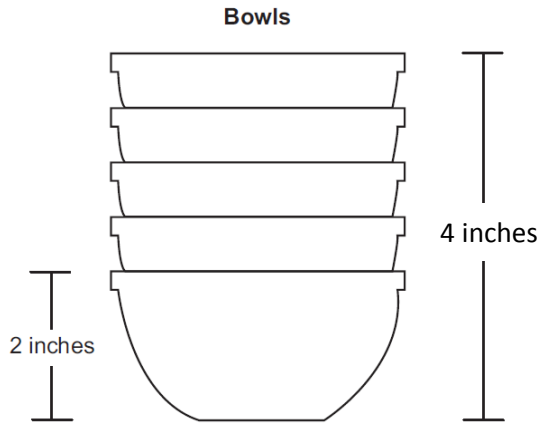
Keng adds a 2-inch-wide frame around all sides of his canvas.

B. Write a polynomial expression, in simplified form, that represents the total area of the canvas and the frame.

Keng is unhappy with his 2-inch-wide frame, so he decides to put a frame with a different width around his canvas. The total area of the canvas and the new frame is given by the polynomial $h^2 + 10h + 16$, where h represents the height of the canvas.

C. Determine the width of the new frame. Show all your work. Explain why you did each step.

2. The diagram below shows 5 identical bowls stacked one inside the other.



The height of 1 bowl is 2 inches. The height of a stack of 5 bowls is 4 inches.

A. Write an equation using x and y to find the height of a stack of bowls based on any number of bowls.

B. Describe what the x and y variable represent.

C. What is the height, in inches, of a stack of 10 bowls?