


Valley County Challenge

Word Problem
Solution
Week



1

The following approach is just one of many ways to tackle the word problem

2

Mulch

You have just started your own company, Prairie Sage Landscaping LLC. Your first client has asked you to mulch several flower beds. Rounding off to the nearest foot, you jotted down these measurements: the rectangular bed in front of the house is 68 feet by 6 feet; the island in the circular driveway has a diameter of 33 feet; and the bed at the driveway entrance resembles a right triangle that has sides of 15, 26, and 32 feet. How many bags of mulch should your order?

3

Mulch

rectangular bed is 68 feet by 6 feet; island has a diameter of 33 feet; resembles a right triangle that has sides of 15, 26, and 32 feet

4

Key Info

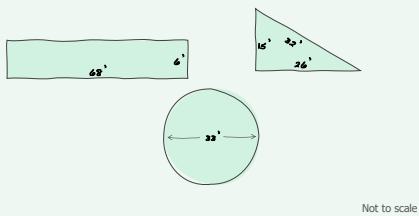
Knowns

- Rectangular bed is 68 feet by 6 feet
- Island has a diameter of 33 feet
- Resembles a right triangle that has sides of 15, 26, and 32 feet

5

Drawing

Preliminary Sketch



6

Key Info

Knowns

- Rectangular bed is 68 feet by 6 feet
- Island has a diameter of 33 feet
- Resembles a right triangle that has sides of 15, 26, and 32 feet

7

Rewrite

Knowns

- **Rectangular bed is 68 feet by 6 feet**
- Island has a diameter of 33 feet
- Resembles a right triangle that has sides of 15, 26, and 32 feet

8

Rewrite

Knowns

- **Length of the rectangle is 68 feet; width is 6 feet**
- Island has a diameter of 33 feet
- Resembles a right triangle that has sides of 15, 26, and 32 feet

9

Rewrite

Knowns

- Length of the rectangle is 68 feet; width is 6 feet
- **Island has a diameter of 33 feet**
- Resembles a right triangle that has sides of 15, 26, and 32 feet

10

Rewrite

Knowns

- Length of the rectangle is 68 feet; width is 6 feet
- **Diameter of the island is 33 feet**
- Resembles a right triangle that has sides of 15, 26, and 32 feet

11

Rewrite




Knowns

- Length of the rectangle is 68 feet; width is 6 feet
- Diameter of the island is 33 feet
- **Resembles a right triangle that has sides of 15, 26, and 32 feet**

12

Triangles




Types

- Scalene  no sides equal
no angles equal
- Isosceles  two sides equal
two angles equal
- Equilateral  all sides equal
all angles equal

13

Triangles

Types

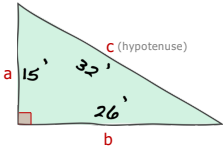
- Acute  all angles $< 90^\circ$
- Right  one angle = 90°
- Obtuse  one angle $> 90^\circ$

14

Triangles

Pythagorean Theorem

Resembles a right triangle . . .

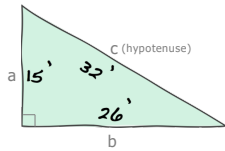


15

Triangles

Pythagorean Theorem

Resembles a right triangle . . .



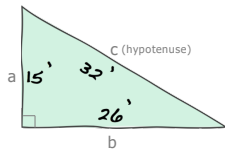
$$a^2 + b^2 = c^2$$

16

Triangles

Pythagorean Theorem

Resembles a right triangle . . .



$$c^2 = a^2 + b^2$$

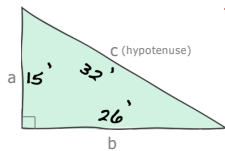
Whatever you do to one side you MUST do to the other side!

17

Triangles

Pythagorean Theorem

Resembles a right triangle . . .



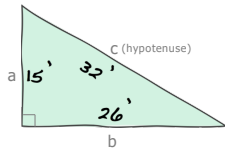
$$\sqrt{c^2} = \sqrt{a^2 + b^2}$$

18

Triangles

Pythagorean Theorem

Resembles a right triangle . . .



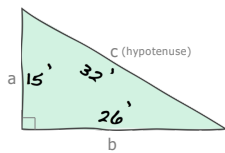
$$c = \sqrt{a^2 + b^2}$$

19

Triangles

Pythagorean Theorem

Resembles a right triangle . . .



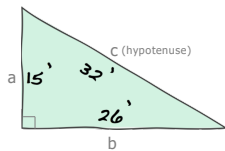
$$c = \sqrt{15^2 + 26^2}$$

20

Triangles

Pythagorean Theorem

Resembles a right triangle . . .



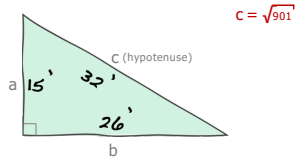
$$c = \sqrt{225 + 676}$$

21

Triangles

Pythagorean Theorem

Resembles a right triangle . . .

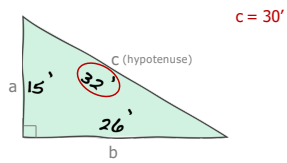


22

Triangles

Pythagorean Theorem

Resembles a right triangle . . .

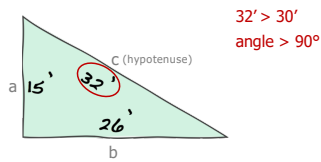


23

Triangles

Pythagorean Theorem

Resembles a right triangle . . .



24

Triangles

Pythagorean Theorem

Resembles a right triangle . . .

Online triangle calculator:
<https://www.calculator.net/triangle-calculator.html>

angle $\approx 99.1^\circ$
 Δ area $< 1.5\%$

25

Triangles

Pythagorean Theorem

Resembles a right triangle . . .

"Close enough!"

26

Rewrite

Knowns

- Length of the rectangle is 68 feet; width is 6 feet
- Diameter of the island is 33 feet
- **Resembles a right triangle that has sides of 15, 26, and 32 feet**

27

Rewrite

Knowns

- Length of the rectangle is 68 feet; width is 6 feet
- Diameter of the island is 33 feet
- **Base of the triangle is 26 feet; height is 15 feet**

28

Rewrite

Knowns

- Length **of the rectangle** is 68 feet; width is 6 feet
- Diameter **of the island** is 33 feet
- Base **of the triangle** is 26 feet; height is 15 feet

29

Rewrite

Knowns

- Length is 68 feet; width is 6 feet
- Diameter is 33 feet
- Base is 26 feet; height is 15 feet

30

Rewrite

Knowns

- Length is 68 feet; width is 6 feet
- Diameter is 33 feet
- Base is 26 feet; height is 15 feet

Dimensions

31

Rewrite

Knowns

- Length is 68 feet; width is 6 feet
- Diameter is 33 feet
- Base is 26 feet; height is 15 feet

"measurements in one direction"

32

Substitutions

Dimensions

- Length
- Width
- Diameter
- Base
- Height

Nouns

33

Substitutions

Dimensions

- Length as l
- Width as w
- Diameter as d
- Base as b
- Height as h

Nouns

34

Rewrite

Knowns

- Length is 68 feet; width is 6 feet
- Diameter is 33 feet
- Base is 26 feet; height is 15 feet

35

Rewrite

Knowns

- l is 68 feet; w is 6 feet
- d is 33 feet
- b is 26 feet; h is 15 feet

36

Rewrite

Knowns

- l is 68 feet; w is 6 feet
- d is 33 feet
- b is 26 feet; h is 15 feet

Verb

37

Rewrite

Knowns

- l = 68 feet; w = 6 feet
- d = 33 feet
- b = 26 feet; h = 15 feet

"is equal to"

38

Rewrite

Knowns

- l = 68 feet; w = 6 feet
- d = 33 feet
- b = 26 feet; h = 15 feet

Abbreviations
ft

39

Rewrite

Knowns

- $l = 68$ ft; $w = 6$ ft
- $d = 33$ ft
- $b = 26$ ft; $h = 15$ ft

40

Rewrite

Knowns

- $l = 68$ ft; $w = 6$ ft
- $d = 33$ ft
- $b = 26$ ft; $h = 15$ ft

41

Mulch

How many bags of mulch should your order?

42

Rewrite

Unknowns

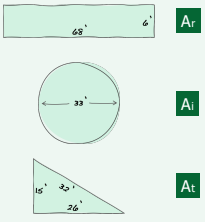
- How many bags?

43

Solution

Knowns

- $l = 68$ ft; $w = 6$ ft
- $d = 33$ ft
- $b = 26$ ft; $h = 15$ ft



$A_r = l \times w$

$A_c = \pi d^2/4$

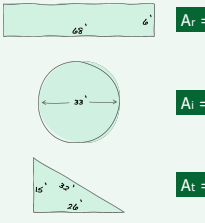
$A_t = \frac{1}{2}b \times h$

44

Solution

Knowns

- $l = 68$ ft; $w = 6$ ft
- $d = 33$ ft
- $b = 26$ ft; $h = 15$ ft



$A_r = l \times w$




$A_c = \pi d^2/4$

$A_t = \frac{1}{2}b \times h$

45

Solution




Knowns

- $A_r = 68 \text{ ft} \times 6 \text{ ft}$  $A_r = l \times w$
- $d = 33 \text{ ft}$  $A_c = \pi d^2/4$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$  $A_t = 1/2 b \times h$

46

Solution




Knowns

- $A_r = (68 \times 6)(\text{ft})(\text{ft})$  $A_r = l \times w$
- $d = 33 \text{ ft}$  $A_c = \pi d^2/4$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$  $A_t = 1/2 b \times h$

47

Solution




Knowns

- $A_r = 408(\text{ft})(\text{ft})$  $A_r = l \times w$
- $d = 33 \text{ ft}$  $A_c = \pi d^2/4$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$  $A_t = 1/2 b \times h$

48

Solution


Knowns

- $A_r = 408(\text{ft})(\text{ft})$  $A_r = l \times w$
- $d = 33 \text{ ft}$  $A_c = \pi d^2/4$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$  $A_t = 1/2 b \times h$

49

Units of Measurement

Square Feet

(ft)(ft): ft^2 

sq ft

SF




□

▣

50

Solution

Knowns


- $A_r = 408(\text{ft})(\text{ft})$  $A_r = l \times w$
- $d = 33 \text{ ft}$  $A_c = \pi d^2/4$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$  $A_t = 1/2 b \times h$

51


Solution

Knowns


- $A_r = 408 \text{ ft}^2$
- $d = 33 \text{ ft}$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$



$A_r = l \times w$



$A_i = \pi d^2/4$




$A_t = \frac{1}{2}b \times h$

52


Solution

Knowns


- $A_r = 408 \text{ ft}^2$
- $d = 33 \text{ ft}$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$



$A_r = l \times w$



$A_i = \pi d^2/4$




$A_t = \frac{1}{2}b \times h$

53


Solution

Knowns


- $A_r = 408 \text{ ft}^2$
- $A_i = \frac{\pi(33 \text{ ft})^2}{4}$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$



$A_r = l \times w$



$A_i = \pi d^2/4$






$A_t = \frac{1}{2}b \times h$

54

Solution




Knowns

- $A_r = 408 \text{ ft}^2$  $A_r = l \times w$
- $A_i = \frac{\pi(1,089)\text{ft}^2}{4}$  $A_i = \pi d^2/4$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$  $A_t = \frac{1}{2}b \times h$

55

Solution




Knowns

- $A_r = 408 \text{ ft}^2$  $A_r = l \times w$
- $A_i \approx 272(\pi)\text{ft}^2$  $A_i = \pi d^2/4$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$  $A_t = \frac{1}{2}b \times h$

56

Solution

Knowns

- $A_r = 408 \text{ ft}^2$  $A_r = l \times w$
- $A_i \approx 272(\pi)\text{ft}^2$  $A_i = \pi d^2/4$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$  $A_t = \frac{1}{2}b \times h$

57

3.14159...

What is pi?

- $\pi = C/d$
- Constant
- Irrational
- Transcendental

58

3.14159...

How much pi do we need?



$\pi \approx 3.141592653589793$

59

Solution

Knowns

- $A_r = 408 \text{ ft}^2$



$A_r = l \times w$

- $A_i \approx 272(\pi)\text{ft}^2$



$A_i = \pi d^2/4$

- $b = 26 \text{ ft}; h = 15 \text{ ft}$






$A_t = 1/2b \times h$

60

Solution




Knowns

- $A_r = 408 \text{ ft}^2$  $A_r = l \times w$
- $A_i \approx 272(3.14)\text{ft}^2$  $A_i = \pi d^2/4$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$  $A_t = \frac{1}{2}b \times h$

61

Solution




Knowns

- $A_r = 408 \text{ ft}^2$  $A_r = l \times w$
- $A_i = 854 \text{ ft}^2$  $A_i = \pi d^2/4$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$  $A_t = \frac{1}{2}b \times h$

62

Solution




Knowns

- $A_r = 408 \text{ ft}^2$  $A_r = l \times w$
- $A_i = 854 \text{ ft}^2$  $A_i = \pi d^2/4$
- $b = 26 \text{ ft}; h = 15 \text{ ft}$  $A_t = \frac{1}{2}b \times h$

63

Solution




Knowns

- $A_r = 408 \text{ ft}^2$  $A_r = l \times w$
- $A_i = 854 \text{ ft}^2$  $A_i = \pi d^2/4$
- $A_t = \frac{1}{2}(26 \text{ ft}) \times 15 \text{ ft}$  $A_t = \frac{1}{2}b \times h$

64

Solution




Knowns

- $A_r = 408 \text{ ft}^2$  $A_r = l \times w$
- $A_i = 854 \text{ ft}^2$  $A_i = \pi d^2/4$
- $A_t = 13 \text{ ft} \times 15 \text{ ft}$  $A_t = \frac{1}{2}b \times h$

65

Solution

Knowns


- $A_r = 408 \text{ ft}^2$  $A_r = l \times w$
- $A_i = 854 \text{ ft}^2$  $A_i = \pi d^2/4$
- $A_t = (13 \times 15) \text{ ft}^2$  $A_t = \frac{1}{2}b \times h$

66


Solution

Knowns


- $A_r = 408 \text{ ft}^2$
- $A_i = 854 \text{ ft}^2$
- $A_t = 195 \text{ ft}^2$



$A_r = l \times w$



$A_i = \pi d^2/4$



$A_t = \frac{1}{2}b \times h$

67

Solution

Knowns

- $A_r = 408 \text{ ft}^2$
- $A_i = 854 \text{ ft}^2$
- $A_t = 195 \text{ ft}^2$

408	ft^2
854	ft^2
+ 195	ft^2
1,457	ft^2

Total Area of Flower Beds

68

Solution

Unknowns

- How many bags?

69

Solution

Unknowns

- How many bags?
 - How big is a bag of mulch?

70

Assumptions

Reasonableness

- Experience
- Research
- Wild Guess

71

Assumptions

Reasonableness


- Experience
- **Research**
- Wild Guess

72

Solution

Unknowns

- How many bags?
- How big is a bag of mulch?

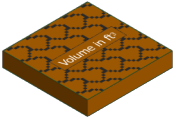


"cu. ft." means "cubic feet" (aka, ft³)

73

Area and Volume

Dimensions



74

Solution

Unknowns

- How many bags?

Total Area of Flower Beds = 1,457 ft²

Assume:

- Average Depth of Mulch = 1 in
- 2 ft³/bag

75

Solution

Unknowns

- How many bags?

Total Area of Flower Beds = 1,457 ft² }
 Assume: } Volume of Mulch
 • Average Depth of Mulch = 1 in } 1,457 ft² × 1 in
 • 2 ft³/bag }

76

Solution

Unknowns

- How many bags?

Total Area of Flower Beds = 1,457 ft² }
 Assume: } Volume of Mulch
 • Average Depth of Mulch = 1 in } (1,457×1)(ft³)(in)
 • 2 ft³/bag }

77

Solution

Unknowns

- How many bags?

Total Area of Flower Beds = 1,457 ft² }
 Assume: } Volume of Mulch
 • Average Depth of Mulch = 1 in } 1,457(ft³)(in)
 • 2 ft³/bag }

12 in = 1 ft or 12 in/ft or ft/12 in

78

Solution

Unknowns

- How many bags?

Total Area of Flower Beds = 1,457 ft² }
 Assume: }
 • Average Depth of Mulch = 1 in }
 • 2 ft³/bag }

Volume of Mulch
 $1,457(\text{ft}^2)(1\text{in})(\frac{\text{ft}}{12})$

12 in = 1 ft or 12 in/ft or ft/12 in

79

Solution

Unknowns

- How many bags?

Total Area of Flower Beds = 1,457 ft² }
 Assume: }
 • Average Depth of Mulch = 1 in }
 • 2 ft³/bag }

Volume of Mulch
 $\frac{1,457}{12} \text{ ft}^3$

80

Solution

Unknowns

- How many bags?

Total Area of Flower Beds = 1,457 ft² }
 Assume: }
 • Average Depth of Mulch = 1 in }
 • 2 ft³/bag }

Volume of Mulch
 121 ft^3

81

Solution

Unknowns

- How many bags?

Total Area of Flower Beds = 1,457 ft² }
 Assume: } Volume of Mulch
 • Average Depth of Mulch = 1 in } 121 ft³
 • 2 ft³/bag Equivalent to bag/2 ft³

82

Solution

Unknowns

- How many bags?

Total Area of Flower Beds = 1,457 ft² }
 Assume: } Volume of Mulch
 • Average Depth of Mulch = 1 in } 121 ft³
 • 2 ft³/bag Equivalent to bag/2 ft³ $\frac{\text{bag}}{2} \times 121 \cancel{\text{ft}^3}$

83

Solution

Unknowns

- How many bags?

Total Area of Flower Beds = 1,457 ft² }
 Assume: } Volume of Mulch
 • Average Depth of Mulch = 1 in } 121 ft³
 • 2 ft³/bag Equivalent to bag/2 ft³ $\frac{121}{2} \text{ bags}$

84

Solution

Unknowns

- How many bags?

Total Area of Flower Beds = 1,457 ft²

Assume:

- Average Depth of Mulch = 1 in
- 2 ft³/bag **Equivalent to bag/2 ft³**

Volume of Mulch
121 ft³

61 bags
(given the assumptions)

85

Report

Mulch

I have just started my own company, Prairie Sage Landscaping LLC. My first client has asked me to mulch three flower beds totaling 1,457 square feet. Assuming an average depth of mulch of one inch, and two cubic feet of mulch per bag, I will have to order at least 61 bags of mulch.

86

Drawing

Final Diagram

Not to scale

87

This was one of many ways to work through the word problem
