Teaching Problem | **What's Wrong?**

Multiple Outfits

Teaching Goal

After participating in this lesson, students will be able to identify a reasoning error presented in the problem. Students will also choose a representation, either visual or numerical, and use it to solve the problem.

Problem

> Victoria has four shirts-1 yellow, 1 red, 1 with blue stripes, and 1 plaid. She also has three pairs of shorts-1 tan, 1 black, and 1 white. Victoria thinks that with these she can make 7 different shirt-and- shorts outfits.
>
> Victoria's thinking ▶ 4 + 3 = 7

Teaching Plan

1. Present the problem to the students.
2. Have the students read the problem.
3. Lead a whole-group discussion. Consider using the following questions as part of the discussion:

How many different outfits can Victoria make if she wears the yellow shirt with a pair of shorts? 3

How many different outfits can Victoria make if she wears the red shirt with a pair of shorts? 3

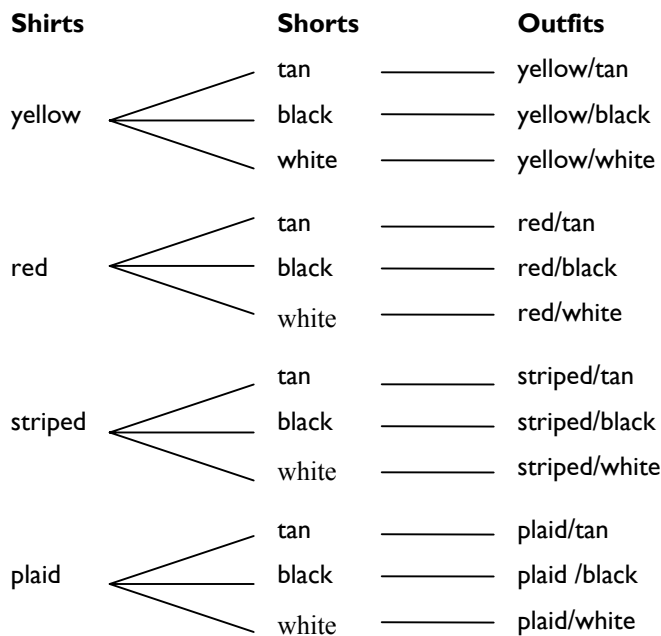**How many different outfits can Victoria make if she wears the striped shirt with a pair of shorts?** 3

How many different outfits can Victoria make if she wears the plaid shirt with a pair of shorts? 3

Victoria thought she could make only 7 different outfits. What is wrong with her thinking? She merely added the number of shirts to the number of shorts without considering the fact that each shirt can be paired with each of the three pairs of shorts to make an outfit.

How can you find Victoria's correct number of outfits? Students may suggest applying the counting principle, which states that if there are x outcomes for the first event and outcomes for the second event, then the total number of possible outcomes can be found by multiplying x times y. Therefore, 4 shirts X 3 shorts = 12 outfits.

Does anyone have a different strategy? Some students may suggest drawing a tree diagram to illustrate the combinations that make up the 12 different outfits.

Shirts	Shorts	Outfits
yellow	tan	yellow/tan
	black	yellow/black
	white	yellow/white
red	tan	red/tan
	black	red/black
	white	red/white
striped	tan	striped/tan
	black	striped/black
	white	striped/white
plaid	tan	plaid/tan
	black	plaid /black
	white	plaid/white

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You may wish to encourage students to use a specific type of representation to solve the different problems in this section. You may also have them try using multiple representations such as making a drawing and writing an equation to solve one or more of the problems.

Problem 7   Perennial Garden

Last year, Marsha gave Grandma 7 plants for her herb garden. This year, Uncle Ned doubled Grandma's number of herb plants, which brought the total number of plants to 24. Marsha figures that there must have been 17 plants in the garden before she and Uncle Ned gave Grandma the additional ones.

Marsha's thinking ▶ Let *P* = number of plants that Grandma started with.

$$2(P + 7) = 24$$
$$2P + 14 = 48$$
$$2P = 34$$
$$P = 17$$

There is something wrong with Marsha's thinking.

1. Show how you would solve the problem.

**2.** Explain the error in Marsha's thinking.

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Teaching Problem │ **What Questions Can You Answer?**

A Matter of Degrees

Teaching Goal

After participating in this lesson, students should be cognizant of the breadth and depth of questions that can be constructed with given data. They should also be able to find answers to questions they pose.

Problem

∠AOC is a right angle.
∠BOD is a right angle.
∠BOC measures 30°
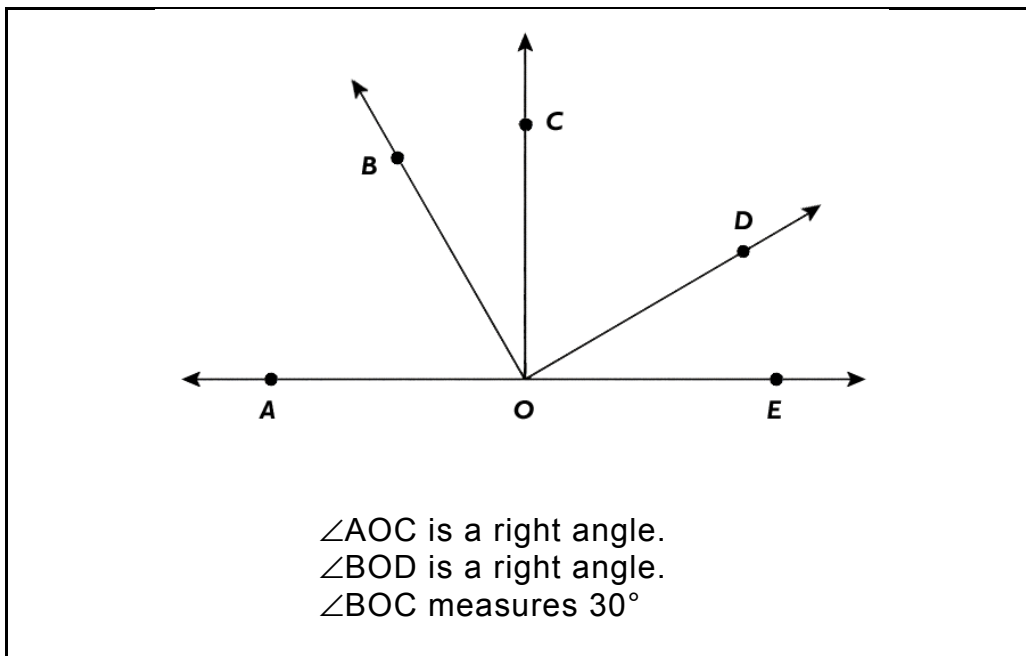
Teaching Plan

1. Display the above figure on the overhead projector or draw it on a chalkboard or white board.
2. Ask students to read the information.
3. Have one student come to the board and mark the angles according to the given information; that is, marking angles AOC and BOD with right-angle symbols and marking angle BOC as having 30°

4. Lead a discussion with the whole class using the following questions as part of the discussion:

What information are you given? The number of degrees in three of the angles in the diagram 90°, 90°, and 30°,

When you see a diagram of angles like this, the teacher usually asks some questions about the diagram. Today you are going to get a chance to be the teacher and think of some questions that could be answered with the given information. Can you think of one such question? One question that might be suggested is, "How many degrees are there in ∠COE"? Record students' questions on the board. Although each problem asks for two questions, encourage students to generate as many questions as possible including the following:

What is the measure of ∠COO? 60°

What is the measure of ∠BOA? 60°

What is the measure of ∠DOE? 30°

What is the measure of ∠AOE? 180°

5. After a variety of questions have been generated, invite students to find their solutions.

How can you be sure that ∠COO measures 60°?
It is given that ∠BOD is a right angle and that ∠BOC measures 30°.
Since ∠BOC is contained in ∠BOD, then 90°- 30°= 60°.

How can you be sure that ∠AOE measures 180°?
Angle AOE represents the sum of the two adjacent right angles, so 90° + 90° = 180°.

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Almost all students will be able to achieve some level of success with this lesson. The sophistication of questions posed depends on the developmental level of each student.

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Problem 1   Music Groups

Felipe's teacher placed 24 marbles in a bag. Half of the marbles were green. The rest were either red or blue. Felipe reached into the bag and pulled out a marble. What is the probability that the marble Felipe picked out of the bag was blue? Compare the different plans using a table or chart and show the total cost of each plan.

Music Group Membership

Band · 24 · 8 · Chorus · 32

5

2 · 6

28

Orchestra
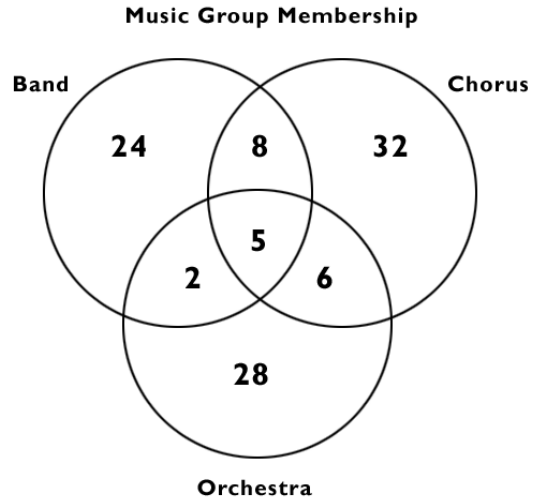
Write two questions you can answer from the data shown in the Venn diagram.

1. _____

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2. . _____

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3. Find the answer to your first question. Show your work

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