

SAMPLE PROBLEMS

(These problems are taken from the Teaching Guides for Course C. Many of them include notes [enclosed in rectangles] which provide mathematical and pedagogical explanations and suggestions. Collectively, over the entire year's material, these notes constitute substantial professional development.)

15. Kwame has a penny, an ordinary die, and the set of 13 spades from a deck of cards.

Suppose he tosses the coin, rolls the die, and selects a card at random from the set.

How many different outcomes are there for the three events?

These are some things that should be reviewed during the class discussion:

- Each outcome for the series of events includes three parts: result for the coin; result for the die; result for the card. So Head-3-Ace and Tail-4-Ace are two outcomes.
- The order in which the activities are carried out, or thought about, has no relation to the set of outcomes. Head-3-Ace, 3-Ace-Head, and Ace-Head-3 are all the same outcome.
- The number of different outcomes for the three events is the product of the numbers of different, equally likely results for the individual events. So in this case:

$$\frac{2}{\substack{\text{Head or Tail} \\ \text{(outcomes} \\ \text{for coin)}}} \times \frac{6}{\substack{(1, 2, 3, 4, 5, 6) \\ \text{(outcomes} \\ \text{for die)}}} \times \frac{13}{\substack{\text{A, K, Q, J, ... 2} \\ \text{(outcomes} \\ \text{for card)}}} = \frac{156}{\substack{\text{Different} \\ \text{Outcomes} \\ \text{(for all} \\ \text{3 events)}}$$

In previous grades, students have seen this “Fundamental Counting Principle” develop through many problems that required them to construct systematic lists of outcomes. At this level, our focus will be on applying the principle when it is relevant in given situations—and, of course, recognizing such situations is the first step.

66. Suppose you know that k represents 7. What number is represented by each of these expressions?

a. $36 - 5k$

b. $4(k + 2)$

c. $11 + k^2$

d. $\frac{12}{(k-4)}$

e. $k - (k - 2)$

f. $\frac{(2k+1)}{3}$

69. Amanda works for a crime lab. A certain series of DNA tests takes 8 hours to complete.

- a. What fraction of the series does Amanda complete in 5 hours?
- b. If she works on a series of tests from 8:15 a.m. to 10:55 a.m., what fraction of the series will she complete?
(Hint: number of hours worked \times fraction of job done per hr = fraction of whole job done)
- c. How long does it take Amanda to complete 45% of a series? (Write your answer in both of these forms:

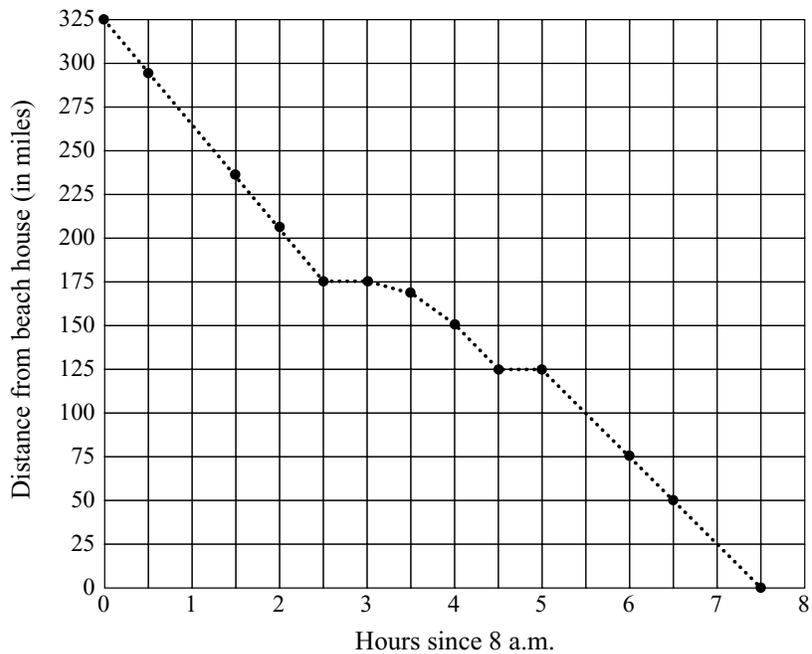
_____ hours ; _____ hrs _____ minutes

79. $(-7) + (3) + (-5) + (2)$

- a. Describe a situation that could be represented by the expression given above.
- b. Find the sum of the four numbers.
- c. Explain what you actually did to find the sum.

77. The Hebert family left home at 8 a.m. last June 1 to drive to a beach house in Florida.

The graph at right shows how far the Hebert's were from the beach house at various times during the trip. Use information given in the graph to answer questions a. – i.



a. What two quantities are related in the graph? Which quantity depends on the other?

b. How far is the Hebert home from the beach house?

c. How far had the family traveled by 10:30 a.m.?

d. Does it appear that the Heberts were traveling at a constant, or almost-constant, rate during the first $2\frac{1}{2}$ hours of the trip? What did you see in the graph that led to your answer?

e. During what other time period does it appear that the Heberts were traveling at a constant, or almost-constant, rate?

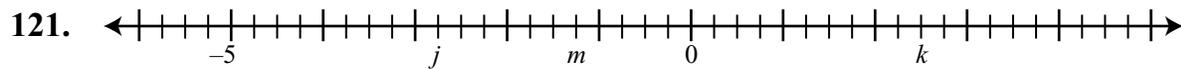
Was it the same rate as during the first $2\frac{1}{2}$ hours of the trip? If not, when were they going faster? How much faster?

f. The family made two stops during the trip. At what times were these stops?

g. During part of the trip, highway repair work was being done. About how many miles of the highway do you think were being repaired? What was the Heberts' average speed on this part of the trip?

h. What was the family's average speed for the whole trip?

i. At what time did they arrive at the beach house?



a. What number is represented by each:

j ; k ; m ; $-k$; $-j$; $j + k$; $m + j$

b. Which number is bigger, j or m ?

Explain how you know this.

c. What number is halfway between j and m ?

d. The distance between j and k is how many units?

e. The distance between -5 and m is how many units?

140. A 100-watt incandescent light bulb and a 23-watt fluorescent bulb each have brightness of 1600 lumens.

The Wilson family home now has eighteen 100-watt bulbs, which burn on an average of 4 hours per day. Notice:

i. $18 \text{ bulbs} \times 100 \text{ watts per bulb} = 1800 \text{ watts (or 1.8 kilowatts)}$

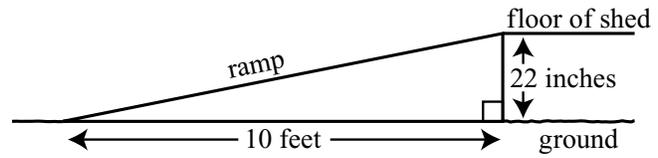
ii. $1.800 \text{ kilowatts} \times 4 \text{ hours per day} = 7.2 \text{ kilowatt-hours per day}$

Suppose the Wilsons replace all the 100-watt bulbs with 23-watt fluorescent bulbs.

a. How many kilowatt-hours per day will those new bulbs use? (Follow the example in equations i. and ii.)

b. The Wilsons pay 8.1¢ per kilowatt-hour for electricity. How much will they save per week by switching to the new bulbs?

148. The floor of an old shed is 22 inches above the ground. A wooden ramp is used to move the lawn mower and wheel barrow up to the floor of the shed.



Picture not drawn to scale.

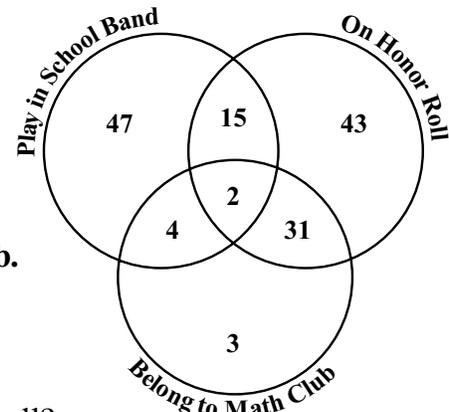
- How long is the ramp?
- What is the slope of the ramp?

The owner plans to build a new shed whose floor will be 33 inches above the ground. He wants the new ramp to have the same slope as the old one.

- How long will the new ramp be?

151. There are 325 students enrolled at Eleanor Roosevelt Middle School. The diagram at right gives information about how many of them are on Honor Roll, play in the Band, and/or belong to the Math Club.

Use information from the diagram to answer questions a. – e.



Students at
Eleanor Roosevelt
Middle School

- What percent of all the students are on Honor Roll?
- How many students do not play in Band, do not belong to the Math Club, and are not on Honor Roll?
- How many Band members are on Honor Roll?
- What percent of Math Club members are in Band?
- How many Honor Roll students belong to the Math Club but do not play in Band?