Worksheet 1: The Case of the Doubtful Distance

1. Route A = 8,000 ft. (5 units + 3 units = 8 units · 1,000 feet)
   Route B = 10,000 ft. (4 units + 5 units + 1 unit = 10 units · 1,000 feet)
   Route C = 12,000 ft. (1 unit + 3 units + 2 units + 2 units + 2 units + 2 units = 12 units · 1,000 feet)
2. Route A = 8,000 ft. / 2,000 ft. per hr. = 4 hours
   Route B = 10,000 ft. / 3,000 ft. per hr. = 3.33 hours = 3 hours, 20 minutes
   Route C = 12,000 ft. / 6,000 ft. per hr. = 2 hours

Bonus Worksheet 1: The Case of the Perilous Planting

1. To calculate the height of a mature tree, set up a proportion showing the relationship between a tree and its shadow. A one-foot shadow is cast by a three-foot tree, so a 30-foot shadow would be cast by a 90-foot tree. As a proportion this is shown as 30 ft./x feet = 1 foot /3 feet. Solving for x leaves x = 90 feet. Therefore, 60 feet from the school building is not a safe distance.
2. 180 feet. Set up a proportion 6 ft./3 ft. = x ft./90 ft. Solving for x leaves x = 180

Now Try This: The length of a shadow of a 45-foot-tall building can be determined by setting up a proportion. In this case, 1/3 = x/45. Solving for x leaves x = 15 feet.

Take-Home Activity 1: The Case of Sweet Proportions

For 32 servings:
Butter: 1 2/3 cups
Sugar: 1 cup
Flour: 3 1/3 cups
Whipping Cream: 6 2/3 tablespoons
Almonds: 4 2/3 cups
Coconut: 4 cups
Chocolate: 10 2/3 squares

Now Try This: For 8 servings:

Butter: 5/12 cup
Sugar: 1/4 cup
Flour: 5/6 cup
Whipping Cream: 1 2/3 tablespoons
Almonds: 1 1/6 cups
Coconut: 1 cup
Chocolate: 2 2/3 squares

Worksheet 2: A Case of Interest

1. After two years students will have the $500 they deposited plus interest calculated using the formula $I = p \cdot r \cdot t$. Interest = $500 · .049 · 2 = $49, so the students will have $500 + $49 = $549

2–3. Using the growth formula $y = a(1+r)^n$, after two years the students will have $500(1 +.048)^2 or $549.15. So this is the better deal.

Now Try This: Students will need to solve the following equation to figure out how much they need to raise: $600 = a(1.05)^2$, $600 = a(1.1025)$, $600/1.1025 = a$, a = $544.22

Bonus Worksheet 2: The Case of the Smelly Sandwich

1. Growth rate = 100% per week, written as 1.0 as a decimal
2. 10 bacteria per cubic centimeter
3. 1,000 bacteria per cubic centimeter
4. Weeks
5. $10(1 + 1.0)^5 = 10 \cdot 32 = 320$ bacteria per cubic centimeter, so the sandwich was in the locker at least five weeks which is more than a month.
6. $10(1 + 1.0)^6 = 640$ bacteria per cubic centimeter and $10(1 + 1.0)^7 = 1{,}280$ bacteria per cubic centimeter, so the sandwich has been in the locker between six and seven weeks.

Take-Home Activity 2: The Case of the Decaying Car

1. Current value $= 20{,}000(1 - .20)^4 = 20{,}000 \cdot .8^4 = 20{,}000 \cdot .4096 = \$8{,}192.00$
2. Using the decay formula, the value after six years = $\$20{,}000(1 - .20)^6 = \$20{,}000 \cdot .8^6 = \$20{,}000 \cdot .262144 = \$5{,}242.88$. Since the car's value was $8,192.00 after four years, the amount of the decline in value in the additional two years would be $8,192.00 – $5,242.88 = $2,949.12

Now Try This:

1. $30{,}000(1 - .20)^3 = 30{,}000 \cdot .8^3 = 30{,}000 \cdot .512 = \$15{,}360.00$
2. $25{,}000(1 - .20)^1 = 25{,}000 \cdot .8 = \$20{,}000.00$
3. $40{,}000(1 - .20)^5 = 40{,}000 \cdot .8^5 = 40{,}000 \cdot .32768 = \$13{,}107.20$

Worksheet 3: The Case of the Screeching Tires

1. Tire Tracks 1 = $\sqrt{24 \cdot 9.375} = \sqrt{225} = 15$ mph
   Tire Tracks 2 = $\sqrt{24 \cdot 6} = \sqrt{144} = 12$ mph
   Tire Tracks 3 = $\sqrt{24 \cdot 37.5} = \sqrt{900} = 30$ mph
   Tire Tracks 4 = $\sqrt{24 \cdot 24} = \sqrt{576} = 24$ mph
   Tire Tracks 5 = $\sqrt{24 \cdot 150} = \sqrt{3{,}600} = 60$ mph
2. Three of the five cars analyzed were speeding, some more than twice the speed limit. The principal should request that the town install speed bumps.

Now Try This:

Tire Tracks 1 = $\sqrt{24 \cdot 16\ 2/3} = \sqrt{400} = 20$ mph
Tire Tracks 2 = $\sqrt{24 \cdot 66\ 2/3} = \sqrt{1{,}600} = 40$ mph
Tire Tracks 3 = $\sqrt{24 \cdot 104\ 1/6} = \sqrt{2{,}500} = 50$ mph
Two of the three cars exceeded the 20 mph speed limit.

Bonus Worksheet 3: The Case of the Tardy Transportation

1. *Elm Street route:* 5-minute run time + (2 minutes at light 1 · .5 probability at light 1) + (2 minutes at light 2 · .5 probability at light 2) + (2 minutes at light 3 · .5 probability at light 3) OR 5-minute run time + 2 minutes · .5 probability · 3 lights = 8 minutes

   Washington Road route: 5-minute run time + 1 minute · .1 probability · 4 lights = 5.4 minutes = 5 minutes, 24 seconds

   The Washington Road route is usually faster.
2. The probability of a red light plus the probability of a green light equals 100%. Expressed as a decimal, 100% = 1. So, the probability of a green light on Washington Road is 1 – the probability of a red light or 1 – .1 = .9
   The probability of two green lights in a row on Washington Road = .9 · .9 = .81 or 81.0%
3. The probability of four green lights in a row on Washington Road = .9 · .9 · .9 · .9 = .656 or 65.6%

Take-Home Activity 3: The Case of the Kid Bargain Hunter

1. Costs for each rental company:
   Let's Go: $220 · 2 + .10 · 1,150 = 440 + 115 = $555.00
   Smooth Ride: $100 · 2 + .40 · 1,150 = 200 + 460 = $660.00
   Cheap Wheels: .60 · 1,150 = $690.00
   Uncle Teddy's: $300 · 2 = $600.00

   The family should use Let's Go because it's the cheapest.
2. $t = \$220w + .10n$, where t = total cost, w = number of weeks rented, n = number of miles driven

Now Try This:

Let's Go formula is $t = \$220w + .10n$
Develop a formula for Smooth Ride:
$t = \$100w + .40n$
Since the trip is for two weeks, substitute 2 for w in both formulas and set them equal to each other since they both equal t.
$220 · 2 + .10n = 100 · 2 + .40n$
$440 + .10n = 200 + .40n$
Subtract 200 and $.10n$ from both sides:
$240 = .30n$
Divide both sides by .3 leaving $n = 800$