Name _____Key_____

Date _____   Period _____

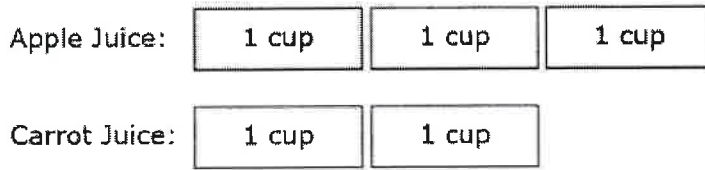## Unit Rates (7.RP.1)

1. This diagram shows how much apple juice is mixed with carrot juice for a recipe.

Apple Juice:

| 1 cup | 1 cup | 1 cup |

Carrot Juice:

| 1 cup | 1 cup |

How many cups of apple juice are used for 1 cup of carrot juice? Show your work to find this unit rate and include units.

$$\frac{3 \text{ cups apple}}{2 \text{ cups carrot}} = \frac{x \text{ cups apple}}{1 \text{ cup carrot}}$$

$\cdot 0.5$

$x = 3 \cdot 0.5 =$

1.5 cups apple juice per 1 cup carrot juice

2. For a drink recipe, there is a ratio of 3 gallons mango juice to 12 gallons of peach juice.

How many gallons of mango juice are used for 1 gallons of peach juice? Show your work to find this unit rate and include units.

3 gallons mango juice ÷ 12 gallons peach juice

= 0.25 or $\frac{1}{4}$ gallons mango juice per 1 gallon peach juice

3. The train ride at the zoo covers a distance of $3\frac{1}{4}$ miles in $\frac{1}{3}$ of an hour.

How many miles per hour does the train go? Show your work to find this unit rate and include units.

$3\frac{1}{4}$ miles ÷ $\frac{1}{3}$ hour = $9\frac{3}{4}$ or 9.75 miles per hour

Name __Key__

Date _____   Period _____

Proportional Relationships (7.RP.2a)

1. Circle __ALL__ the tables below that represent a proportional relationship between x and y.

A. ~~X.~~

x	y
1	4
2	7
3	10
4	13

$\frac{1}{4} \neq \frac{2}{7}$

B. (circled)

x	y
1	4
2	8
3	12
4	16

$\frac{1}{4} = \frac{2}{8}$

C. ~~X~~

x	y
1	6
2	7
3	8
4	9

$\frac{1}{6} \neq \frac{2}{7}$

D. ~~X~~

x	y
5	−2
7	0
9	2
11	4

$\frac{9}{2} \neq \frac{11}{4}$

E. (circled)

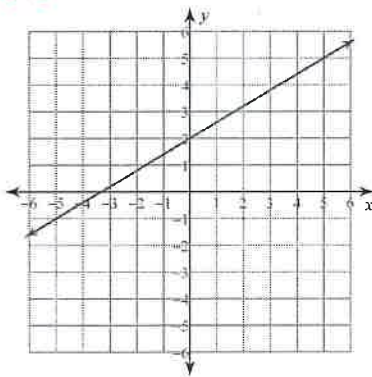| x	y
3	12
5	20
2	8
8	32

$\frac{2}{8} = \frac{8}{32}$

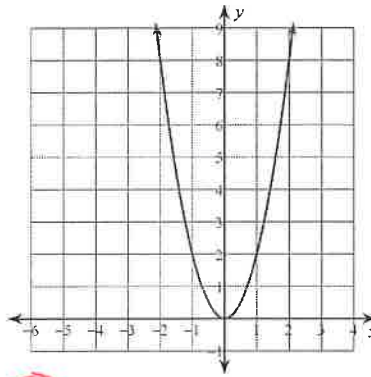2. __Explain__ how you know if a TABLE represents a proportional relationship.

The table has equivalent ratios between the values.

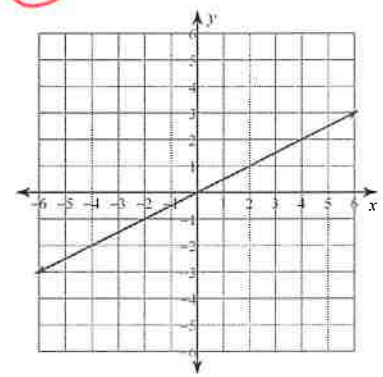3. Circle __ALL__ the graphs below that show a proportional relationship between x and y.
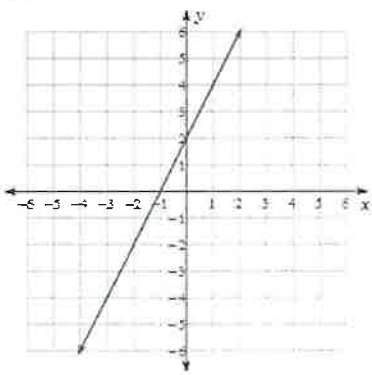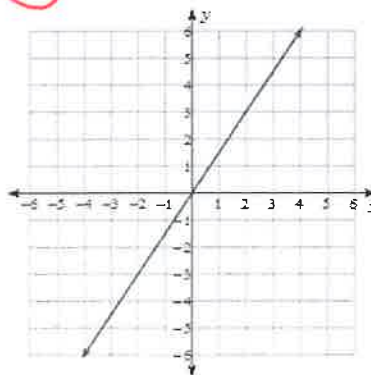
A. ~~X~~

B. ~~X~~

C. (circled)

D. ~~X~~

E. (circled)
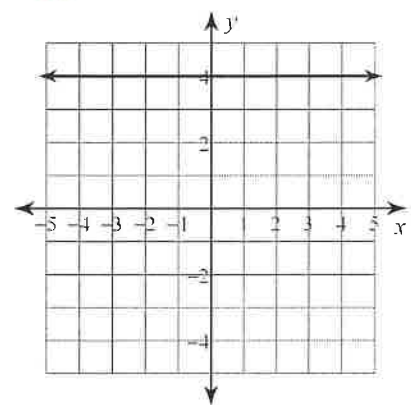

F. ~~X~~

4. __Explain__ how you know if a GRAPH represents a proportional relationship.

The graph is a straight line through (0,0).

Name ___Key___

Date _____   Period _____

Constant of Proportionality and Proportional Equations (7.RP.2c, 7.RP.2b)

1. The following tables show a proportional relationship between x and y.

   A.
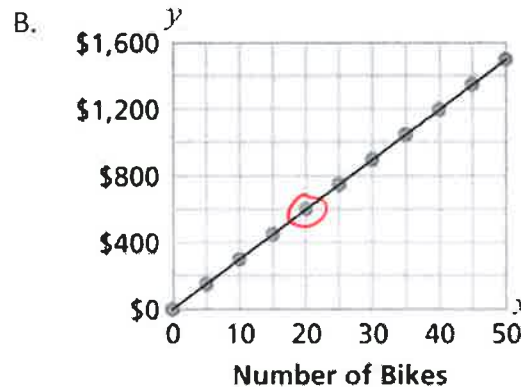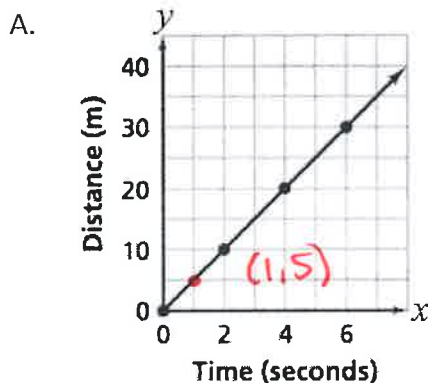 | x | y |
   |---|---|
   | 1 | ·4 4 |
   | 2 | ·4 8 |
   | 3 | ·4 12 |
   | 4 | ·4 16 |

   B.
x	y
3	12
5	20
2	8
8	32

   $$·\tfrac{1}{3} \quad \tfrac{12}{3} = \tfrac{4}{1} \quad ·\tfrac{1}{3}$$

   a. What is the constant of proportionality for table A? __4__

   b. Write an equation of the form $y = rx$ to represent table A. __$y = 4x$__

   c. What is the constant of proportionality for table B? __4__

   d. Write an equation of the form $y = rx$ to represent table B. __$y = 4x$__

2. The following graphs show a proportional relationship between x and y.

   A.

   B.

   $$·0.05 \quad \tfrac{600}{20} = \tfrac{30}{1} \quad ·0.05$$

   a. What is the constant of proportionality for graph A? __5__

   b. Write an equation of the form $y = rx$ to represent graph A. __$y = 5x$__

   c. What is the constant of proportionality for graph B? __30__

   d. Write an equation of the form $y = rx$ to represent graph B. __$y = 30x$__

3. The following equations show a proportional relationship between x and y.

   A. $y = 3.7x$ B. $y = \dfrac{4}{9}x$

   a. What is the constant of proportionality for equation A? __3.7__

   b. What is the constant of proportionality for equation B? __$\dfrac{4}{9}$__

Name ___Key___

Date _____   Period _____

Explaining Coordinate Points (7.RP.2d)

1. The graph at right shows a proportional relationship between x and y.

   What do the following points represent <u>in terms of the situation</u>?

   (0, 0) You have traveled 0 meters after 0 seconds.

   (1, 5) You have traveled 5 meters after 1 second.

   (6, 30) You have traveled 30 meters after 6 seconds.
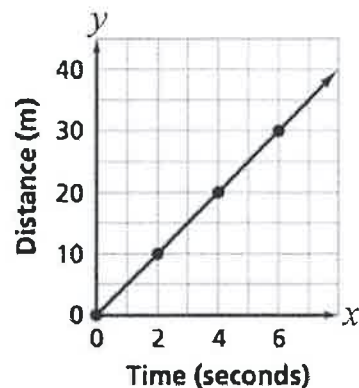
2. The graph at right shows a proportional relationship between x and y.

   What do the following points represent <u>in terms of the situation</u>?

   (0, 0) 0 bikes cost $0.

   (1, 30) 1 bike costs $30.

   (40, 1200) 40 bikes cost $1200.
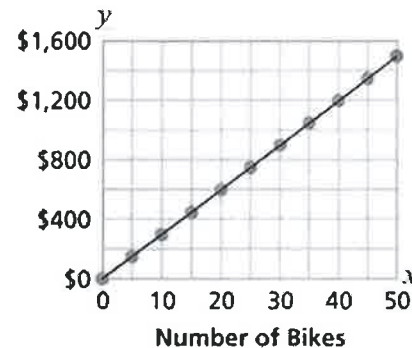
3. The following graph for Superior Buses shows a proportional relationship between x and y.

● East Coast Transport   ■ Superior Buses
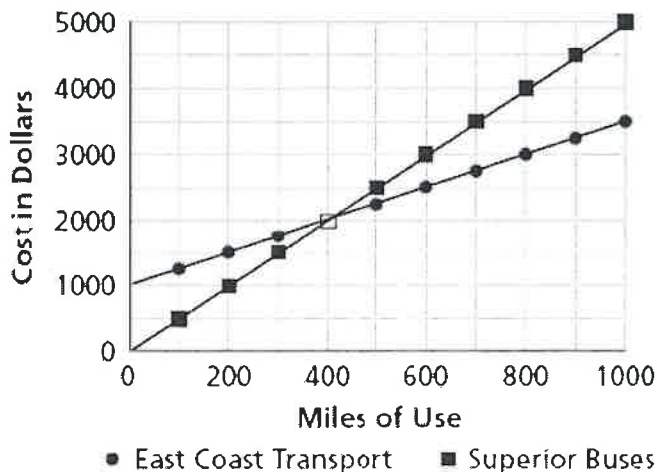
Select True or False for each statement about the graph.

Statement	True	False
Point □ represents the total cost of travel when traveling for 400 miles.	X	
The total cost of travel is $5 when traveling for 1 mile.	X	
The total cost of travel is $600 when traveling for 3000 miles.		X

Name ___Key___

Date _____ Period _____

Multi-Step Proportion Problems (7.RP.3)

1. The ratio of blueberries to mango in a fruit smoothie drink is 5 to 15. What percent of the drink is mango? Write and solve a proportion to find the answer, and include units.

$5 + 15 = 20$ total

$$\frac{15 \text{ mango}}{20 \text{ total}} = \frac{x\%}{100\%}$$

$x = 15 \cdot 5 = 75$

$\cdot 5$

$\boxed{75\% \text{ mango}}$

2. Bill has a paper route in his neighborhood. It takes him 45 minutes to deliver newspapers to the 30 customers on his route. How long will it take Bill to complete his route if he adds 25 more customers in his neighborhood? Write and solve a proportion to find the answer, and include units.

$30 + 25 = 55$ customers

$$\frac{45 \text{ min}}{30 \text{ customers}} = \frac{x \text{ min}}{55 \text{ customers}}$$

$\cdot 1\frac{5}{6}$

$\boxed{82\frac{1}{2} \text{ minutes}}$

$x = 45 \cdot 1\frac{5}{6} = 82\frac{1}{2}$

3. You have lunch at a Thai restaurant with your friends. The bill before tax is $54.75, and the sales tax is 7%. You decide to leave a 20% tip for the waitress based on the pre-tax amount. What will be the amount of the total bill, including tax and tip? Write and solve proportions to find the answer, and include units.

58.5825
+ 10.9500
69.5325

$$\frac{\$54.75}{100\%} = \frac{\$x}{107\%}$$
$\cdot 1.07$

$x = 54.75 \cdot 1.07 = \$58.5825$

$$\frac{\$54.75}{100\%} = \frac{\$x}{20\%}$$
$\cdot 0.2$

$x = 54.75 \cdot 0.2 = \$10.95$

$\boxed{\$69.53}$

4. Shirts Galore sells a Batman shirt for $24.49, but is having a sale for 25% off. Rainbow Shirts sells the same Batman shirt for $21.99, but is having a sale for 15% off. Which store offers the better price, after the discount? Write and solve proportions to find the answer, and include units with your answer.

SG:
$$\frac{\$24.49}{100\%} = \frac{\$x}{25\%}$$
$\cdot 0.25$

RS:
$$\frac{\$21.99}{100\%} = \frac{\$x}{15\%}$$
0.15

$x = 24.49 \cdot 0.25 = \$6.1225$

$24.49 - 6.1225 = \$18.3675$
or
$\$18.37$

$x = 21.99 \cdot 0.15 = \$3.2985$

$21.99 - 3.2985 = \$18.6915$
or
$\$18.69$

$\boxed{\text{Shirts Galore offers the better price.}}$

Name ___Key___

Date _____ Period _____

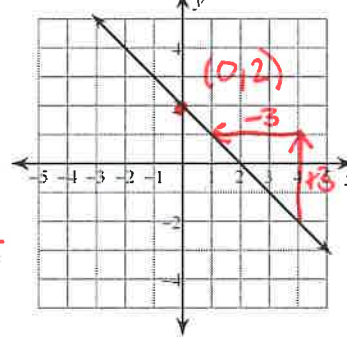# Modeling Linear Relationships (8.F.4)

For each representation, identify the y-intercept and the slope, and write the equation. Show ALL work!

1.
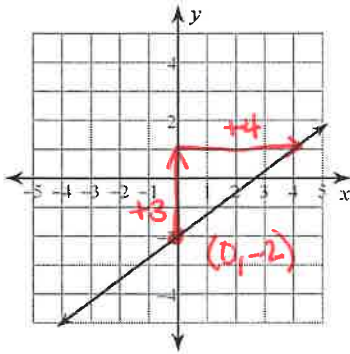
slope: $\dfrac{3}{4}$

y-intercept: -2

equation: $y = \dfrac{3}{4}x - 2$

2. $m = \dfrac{3}{-3} = -1$

slope: -1

y-intercept: 2

equation: $y = -x + 2$

3.

$+2\Big(\begin{array}{cc} 0 & -5 \\ \end{array}\Big)-1$

x	y
2	-6
3	-6.5
8	-9

-0.5

slope: -0.5

y-intercept: -5

equation: $y = -0.5x - 5$

4. $m = \dfrac{-10}{2} = -5$

x	y
0	50
2	40
4	30
6	20

$+2\big(\quad \big)-10$

slope: -5

y-intercept: 50

equation: $y = -5x + 50$

5. Mark opens a bank account with $20.
Each week he plans to deposit $5.

a. Write an equation to model the relationship between the total money in the account T and the number of weeks w.

or $T = 20 + 5w$
     $T = 5w + 20$

b. slope: 5 c. y-intercept: 20

6. A pool with 1600 gallons of water is emptied at a constant rate of 150 gallons every hour.

a. Write an equation to model the relationship between the gallons of water remaining W and the number of hours h.

or $W = 1600 - 150h$
     $W = -150h + 1600$

b. slope: -150 c. y-intercept: 1600

7. $(5, -2)$ and $(3, 4)$

$m = \dfrac{4--2}{3-5} = \dfrac{6}{2} = -3$

$4 = -3(3) + b$
$4 = -9 + b$
$\underline{+9 \quad +9}$
$13 = b$

slope: -3

y-intercept: 13

equation: $y = -3x + 13$

8. $(2, -2)$ and $(4, 5)$

$m = \dfrac{5--2}{4-2} = \dfrac{7}{2}$

$5 = \dfrac{7}{2}(4) + b$
$5 = 14 + b$
$\underline{-14 \quad -14}$
$-9 = b$

slope: $\dfrac{7}{2}$

y-intercept: -9

equation: $y = \dfrac{7}{2}x - 9$

Name __Key__

Date _____ Period _____

Graphing and Comparing Proportional Relationships (8.EE.5)

1. **Graph the following proportional relationships.**

   a. MyTV.com is a video streaming service that charges $4.50 an hour to watch TV. Graph the relationship between the time, in hours, and the total cost.
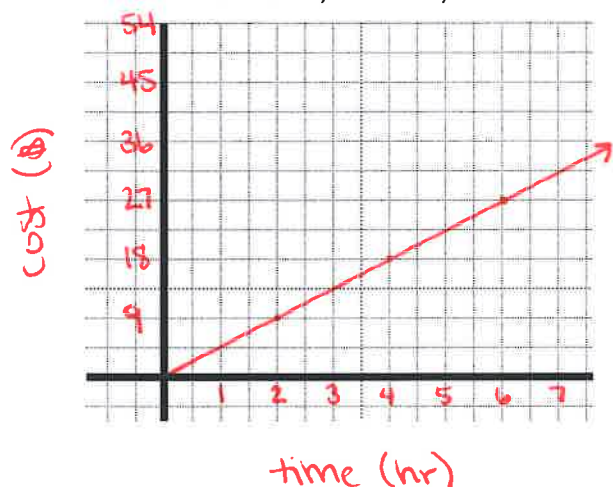
   b. At the market, raspberries cost $1 per pound. Graph the relationship between the weight of the raspberries, in pounds, and the total cost.

2. **Who is saving money faster? __Explain__ your thinking.**

The graph at left models *Mark's* savings account.

The following equation models *Joe's* savings account:

$$m = 5w$$

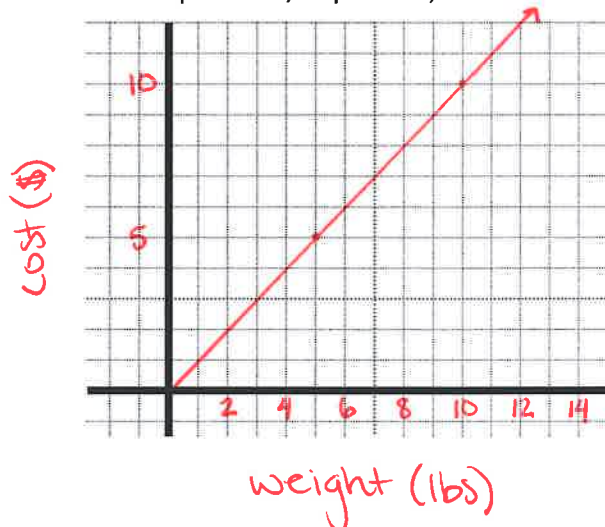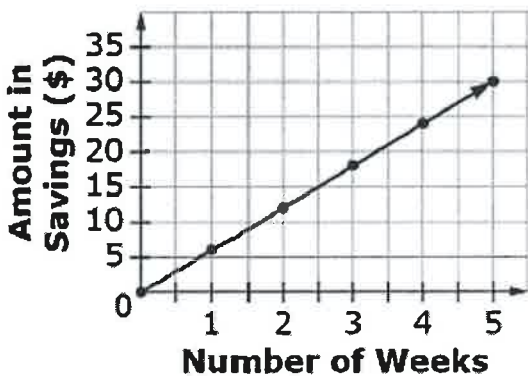where m is the money in the account and w is the number of weeks.

$30 ÷ 5$ weeks $= 6 per week

Mark saves faster.
Mark saves $6 each week, while Joe only saves $5 each week.

3. **Which store has the better price for hamburger meat? __Explain__ your thinking.**

Bulky Store sells 12 pounds of meat for $66. $66 ÷ 12$ lbs $= 5.50 per lb

The table below shows the cost (c) for different pounds of meat (p) for *Streamline Market*:

p	c
3	15
5	25
7	35
9	45
10	50

Streamline Market has the better price.
Streamline charges $5 for each pound of hamburger meat, but Bulky charges $5.50 for each pound.

$15 ÷ 3$ lbs $= 5 per lb

Name **Key**

Date _____   Period _____

Solving One Variable Equations (8.EE.7)

1. Solve the following equations for the value of the variables. **Show all steps!!!**

a. $-5x + 2 = -7x - 12$

$$\underline{+7x \qquad +7x}$$
$$2x + 2 = -12$$
$$\underline{-2 \quad -2}$$
$$2x = -14$$
$$\underline{\div 2 \quad \div 2}$$
$$\boxed{x = -7}$$

b. $3(8x + 8) = -5x - 5$

$$24x + 24 = -5x - 5$$
$$\underline{+5x \qquad \quad +5x}$$
$$29x + 24 = -5$$
$$\underline{-24 \quad -24}$$
$$29x = -29$$
$$\underline{\div 29 \quad \div 29}$$
$$\boxed{x = -1}$$

c. $-2x - 7 = 7(-4x + 7) - 2x$

$$-2x - 7 = -28x + 49 - 2x$$
$$-2x - 7 = -30x + 49$$
$$\underline{+30x \qquad \quad +30x}$$
$$28x - 7 = 49$$
$$\underline{+7 \quad +7}$$
$$28x = 56$$
$$\underline{\div 28 \quad \div 28}$$
$$\boxed{x = 2}$$

2. Melissa's bank account has $1250 dollars in it, and her internet bill is automatically deducting $60 from her account every month. Her bank requires its customers to keep a minimum balance of $350. If Melissa doesn't deposit any additional money in her account, after how many months will her account have $350?

Write an equation in terms of the number of months m. Solve to find the answer and show <u>all</u> steps.

$$1250 - 60m = 350$$
$$\underline{-1250 \qquad \qquad -1250}$$
$$-60m = -900$$
$$\underline{\div -60 \quad \div -60}$$
$$m = 15$$

$$\boxed{\text{After 15 months}}$$

3. In winter, the price of apples suddenly went up by $0.75 per pound. Sam bough 3 pounds of apples at the new price, for a total of $5.88. What was the original price per pound?

Write an equation for the cost in terms of the original price per pound p. Solve to find the answer and show <u>all</u> steps.

$$3(p + 0.75) = 5.88$$
$$3p + 2.25 = 5.88$$
$$\underline{-2.25 \quad -2.25}$$
$$3p = 3.63$$
$$\underline{\div 3 \qquad \div 3}$$
$$p = 1.21$$

$$\boxed{\$1.21 \text{ originally}}$$

Name __*key*__

Date _____   Period _____

Write and Solve Inequalities (7.EE.4b)

1. **Tatiana wants to give friendship bracelets to her 32 classmates. She already has 5 bracelets, and she can buy more bracelets in packages of 4. How many packages does Tatiana need to buy?**

   a. Write an inequality in terms of the number of packages p. Solve to find the answer and show <u>all</u> steps.

   $$5 + 4p \geq 32$$
   $$\underline{-5 \qquad\quad -5}$$
   $$4p \geq 27$$
   $$\underline{\div 4 \qquad \div 4}$$
   $$p \geq 6.75$$

   OR

   $$32 \leq 5 + 4p$$

   $$6.75 \leq p$$

   b. Explain your answer in words. Then, graph the solution on a number line.

   Tatiana needs to buy 7 or more packages of bracelets.

2. **Renna pushed the button for the elevator to go up, but it would not move. The weight limit for the elevator is 450 kilograms, but the current group of passengers weighs a total of 750 kilograms. The passengers each weigh about 75 kilograms. How many passengers need to get off the elevator?**

   a. Write an inequality in terms of the number of passengers p. Solve to find the answer and show <u>all</u> steps.

   $$750 - 75p \leq 450$$
   $$\underline{-750 \qquad\qquad -750}$$
   $$-75p \leq -300$$
   $$\underline{\div -75 \qquad \div -75}$$
   $$p \geq 4$$

   OR

   $$450 \geq 750 - 75p$$

   $$4 \leq p$$

   b. Explain your answer in words. Then, graph the solution on a number line.

   4 or more passengers need to get off the elevator.

3. **Joey is trying to break his own personal record, so he needs to eat more than 72 hot dogs in 10 minutes. After 1 minute of competition, Joey has eaten 10 hot dogs. How many hot dogs does he need to eat per minute for the remaining 9 minutes, in order to break his own record?**

   a. Write an inequality in terms of the number of hot dogs h. Solve to find the answer and show all steps.

   $$10 + 9h > 72$$
   $$\underline{-10 \qquad\qquad -10}$$
   $$9h > 62$$
   $$\underline{\div 9 \qquad \div 9}$$
   $$h > 6.8$$

   OR

   $$72 < 10 + 9h$$

   $$6.8 < h$$

   b. Explain your answer in words. Then, graph the solution on a number line.

   Joey must eat more than 6 hot dogs.

Name _____Key_____

Date _____ Period _____

Likelihood of Events (7.SP.5)

Decide if each of the following events is *impossible, unlikely, not likely or unlikely, likely,* or *certain*.

1. A letter is randomly selected from the word CLOCK. The chance of selecting a vowel is:
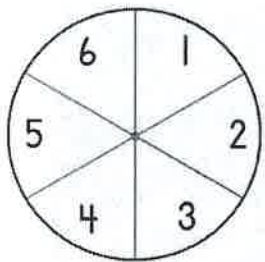
$$P(vowel) = \frac{1}{5}$$ (unlikely)

2. A baby puppy is born. The chance of the puppy being a girl is:

$$P(girl) = \frac{1}{2}$$ (not likely or unlikely)

3. You roll a number cube. The chance of rolling a number greater than 5 is:

$$P(greater than 5) = \frac{1}{6}$$ (unlikely)

4. The spinner below is spun once. The chance of spinning a number greater than 1 is:

$$P(greater than 1) = \frac{5}{6}$$ (likely)

5. A bag contains 15 red cubes and 85 blue cubes. The chance of selecting a red cube is:

$$P(red cube) = \frac{15}{100}$$ (unlikely)

6. A school raffle happens at lunch, but you don't buy a raffle ticket. The chance of you winning the raffle is:

$$P(winning raffle) = 0$$ (impossible)

7. A letter is randomly selected from the word LIEU. The chance of selecting a vowel is:

$$P(vowel) = \frac{3}{4}$$ (likely)

8. A bucket contains 5 red tokens and 5 white tokens. The chance of selecting a red token is:

$$P(red token) = \frac{5}{10}$$ (not likely or unlikely)

Name _____ Key _____

Date _____

Period _____

Experimental Probability and Predictions (7.SP.6)

1. A student brought a very large jar of animal crackers to share with students in class. The student randomly chose 20 crackers from the jar, and recorded the results in the table below.

Lion	2
Camel	1
Monkey	4
Elephant	5
Zebra	3
Penguin	3
Tortoise	2
	Total 20

a. What is the experimental probability of selecting a monkey? Express your answer as a fraction, decimal, and percent.

$$P(monkey) = \frac{4}{20} = 0.2 = 20\%$$

b. Based on the probability, how many monkeys would you expect there to be in the jar, if there are 500 animal crackers in the jar?

$$0.2 \cdot 500 = \boxed{100 \text{ monkeys}}$$

2. Julie rolls a number cube 50 times. She records the result of each roll in the table below.

Number Cube Results

Number	Frequency
1	⊞ⵏ l
②	⊞ⵏ llll
③	⊞ⵏ l
4	⊞ⵏ lll
⑤	⊞ⵏ ⊞ⵏ l
6	⊞ⵏ ⊞ⵏ

a. What is Julie's experimental probability of rolling a prime number? Express your answer as a fraction and percent.

$$P(prime) = \frac{26}{50} = 52\%$$

b. Based on the data, about how many times would Julie expect to roll a prime number, if the number cube is rolled 500 times?
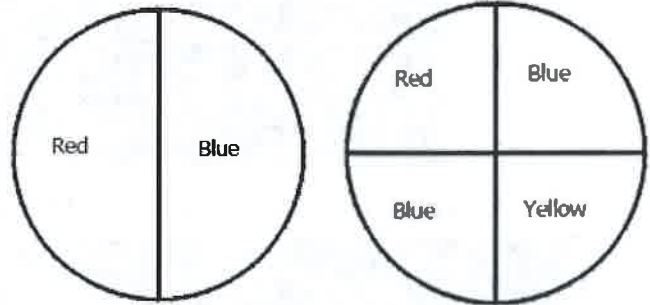
$$0.52 \cdot 500 = \boxed{260 \text{ times}}$$

Uniform Probability (7.SP.7a)

1. **Students are playing a game that requires spinning the two spinners below.**

   a. What is the sample space for this game?

   $$RR \quad BR$$
   $$RB \quad BB$$
   $$RY \quad BY$$
   $$RB \quad BB$$

   b. What is the probability of getting blue on both spins?

   $$P(\text{blue on both}) = \frac{2}{8} = \frac{1}{4}$$

   c. What is the probability of getting blue on *at least* one of the spins?

   $$P(\text{at least one blue}) = \frac{6}{8} = \frac{3}{4}$$

2. **A chance experiment consists of flipping a coin and rolling a number cube.**

   a. What is the sample space of this chance experiment?

H-1	H-4	T-1	T-4
H-2	H-5	T-2	T-5
H-3	H-6	T-3	T-6

   b. What is the theoretical probability of getting heads on the coin and 3 on the number cube?

   $$P(\text{heads and 3}) = \frac{1}{12}$$

   c. What is the theoretical probability of getting tails on the coin and an even number on the number cube?

   $$P(\text{tails and even}) = \frac{3}{12} = \frac{1}{4}$$

Name _____Key_____

Date _____   Period _____

Non-Uniform Probability (7.SP.7b)

1. When Jenna goes to the farmer's market, she usually buys bananas. The number of bananas she might buy and their probabilities are shown in the table below.

Number of Bananas	0	1	2	3	4	5
Probability	0.1	0.1	0.1	0.2	0.2	0.3

a. What is the probability Jenna buys more than 3 bananas? Show your calculations.

$$P(\text{more than 3}) = 0.2 + 0.3 = 0.5$$

b. What is the probability Jenna buys 2 or fewer bananas? Show your calculations.

$$P(\text{2 or fewer}) = 0.1 + 0.1 + 0.1 = 0.3$$

c. What is the probability Jenna does not buy 4 bananas? Show your calculations.

$$P(\text{not 4}) = 1 - 0.2 = 0.8$$

2. When Jenna goes to the farmer's market, she usually buys heads of broccoli. The number of heads of broccoli she might buy and their probabilities are shown in the table below.

Number of Heads of Broccoli	0	1	2	3	4
Probability	$\frac{1}{12}$	$\frac{1}{6}$	$\frac{5}{12}$	$\frac{1}{4}$	$\frac{1}{12}$

a. What is the probability Jenna buys more than 1 head of broccoli? Show your calculations.

$$P(\text{more than 1}) = \frac{5}{12} + \frac{1}{4} + \frac{1}{12} = \frac{3}{4}$$

b. What is the probability Jenna buys less than 2 heads of broccoli? Show your calculations.

$$P(\text{less than 2}) = \frac{1}{6} + \frac{1}{12} = \frac{1}{4}$$

c. What is the probability Jenna does not buy 3 heads of broccoli? Show your calculations.

$$P(\text{not 3}) = 1 - \frac{1}{4} = \frac{3}{4}$$

Compound Events (7.SP.8)

1. **You spin each of the spinners below once, and then <u>multiply</u> the results.**

   a. Create an area model to represent this situation, and find all the possible outcomes.

   Spinner 2

	4	-3	-1
4	16	-12	-4
-3	-12	9	3
-1	-4	3	1

   Spinner 1

   b. What is the probability of spinning a positive product?
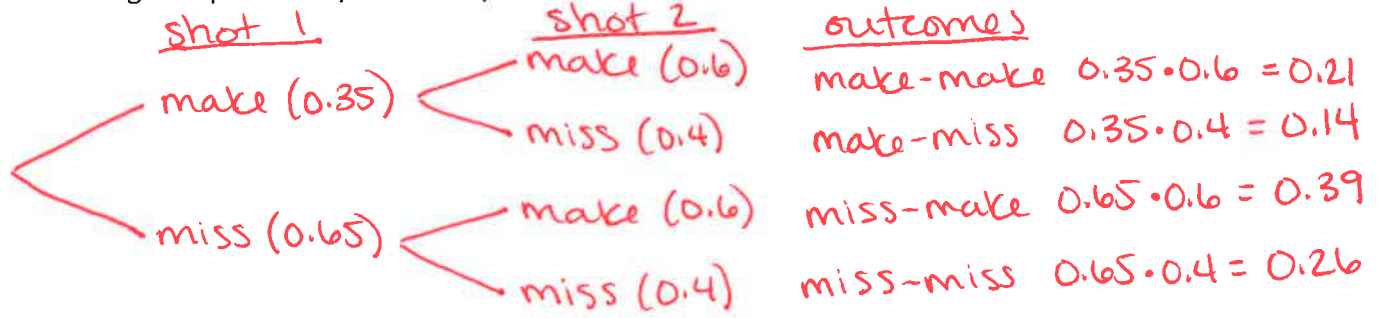
   $$P(\text{positive product}) = \frac{5}{9}$$

   c. What is the probability of spinning a negative product?

   $$P(\text{negative product}) = \frac{4}{9}$$

2. **Mark attempts two free throws at the basketball game. He has a 35% shooting record on the first shot, and 60% on the second shot.**

   a. Make weighted probability tree to represent all the possible outcomes of shooting two free throws.

   shot 1   **shot 2**   **outcomes**

   make (0.35) → make (0.6)   make-make 0.35·0.6 = 0.21
                → miss (0.4)   make-miss 0.35·0.4 = 0.14

   miss (0.65) → make (0.6)   miss-make 0.65·0.6 = 0.39
                → miss (0.4)   miss-miss 0.65·0.4 = 0.26

   b. What is the probability that he will make both free throws?

   $$P(\text{make both}) = 0.21 = 21\%$$

   c. What is the probability that he will miss *at least* one free throw?

   $$P(\text{miss at least one}) = 0.14 + 0.39 + 0.26 = 0.79 = 79\%$$