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**Texas Assessment of Knowledge and Skills**

# Exit Level Math Review

# Lesson 2
## Functional Relationships

**TAKS Objective 1 –** Describe functional relationships in a variety of ways

**Lesson Objectives:**

- Identify the dependent, independent, and constant quantities in a functional relationship
- Write a function to model a functional relationship

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The Texas Assessment of Knowledge and Skills (TAKS) exit level exam covers ten learning objectives. These lessons are designed to teach math concepts specific to each objective as well as strategies to consider when approaching typical TAKS questions. To successfully complete the TAKS exit level exam, the student should be able to:

1) **Describe functional relationships in a variety of ways.**
2) **Demonstrate an understanding of the properties and attributes of functions.**
3) **Demonstrate an understanding of linear functions.**
4) **Formulate and use linear equations and inequalities.**
5) **Demonstrate an understanding of quadratic equations and other nonlinear functions.**
6) **Demonstrate an understanding of geometric relationships and spatial reasoning.**
7) **Demonstrate an understanding of two- and three-dimensional representations of geometric relationships and shapes.**
8) **Demonstrate an understanding of concepts and uses of measurement and similarity.**
9) **Demonstrate an understanding of percents, proportional relationships, probability, and statistics in application problems.**
10) **Demonstrate an understanding of the mathematical processes and tools used in problem solving.**


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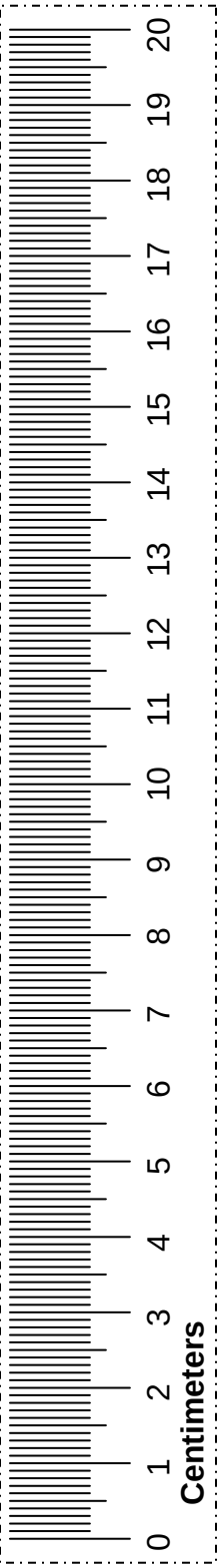
# *TAKS* Mathematics Chart




## Length

| Metric | Customary |
|---|---|
| 1 kilometer = 1000 meters | 1 mile = 1760 yards |
| 1 meter = 100 centimeters | 1 mile = 5280 feet |
| 1 centimeter = 10 millimeters | 1 yard = 3 feet |
| | 1 foot = 12 inches |

## Capacity and Volume

| Metric | Customary |
|---|---|
| 1 liter = 1000 milliliters | 1 gallon = 4 quarts |
| | 1 gallon = 128 fluid ounces |
| | 1 quart = 2 pints |
| | 1 pint = 2 cups |
| | 1 cup = 8 fluid ounces |

## Mass and Weight

| Metric | Customary |
|---|---|
| 1 kilogram = 1000 grams | 1 ton = 2000 pounds |
| 1 gram = 1000 milligrams | 1 pound = 16 ounces |

## Time

1 year = 365 days

1 year = 12 months

1 year = 52 weeks

1 week = 7 days

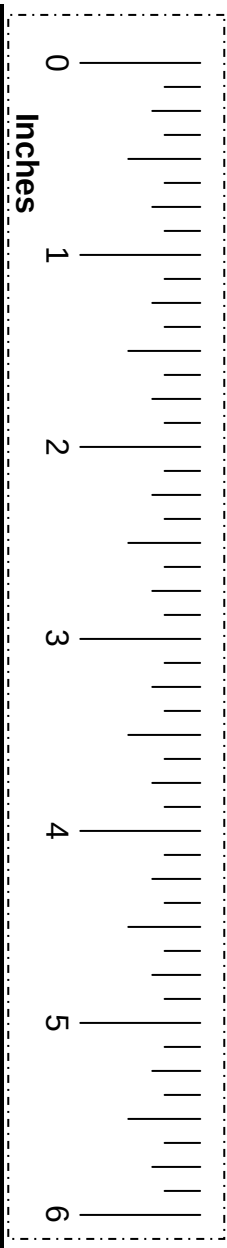
1 day = 24 hours

1 hour = 60 minutes

1 minute = 60 seconds

# *TAKS* Mathematics Chart

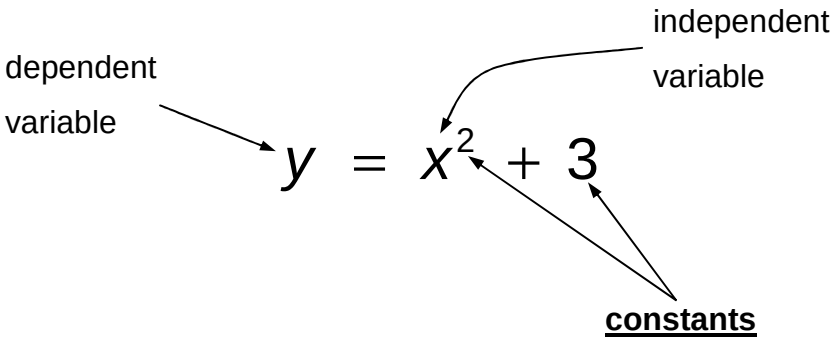
| | | |
|---|---|---|
| **Perimeter** | Rectangle | $P = 2l + 2w$ or $P = 2(l + w)$ |
| **Circumference** | Circle | $C = 2\pi r$ or $C = \pi d$ |
| **Area** | Rectangle | $A = lw$ or $A = bh$ |
| | Triangle | $A = \frac{1}{2}bh$ or $A = \frac{bh}{2}$ |
| | Trapezoid | $A = \frac{1}{2}(b_1 + b_2)h$ or $A = \frac{(b_1+b_2)h}{2}$ |
| | Regular polygon | $A = \frac{1}{2}aP$ |
| | Circle | $A = \pi r^2$ |
| ***P*** represents the perimeter of the base of a three-dimensional figure. | | |
| ***B*** represents the area of the base of a three-dimensional figure. | | |
| **Surface Area** | Cube (total) | $S = 6s^2$ |
| | Prism (lateral) | $S = Ph$ |
| | Prism (total) | $S = Ph + 2B$ |
| | Pyramid (lateral) | $S = \frac{1}{2}Pl$ |
| | Pyramid (total) | $S = \frac{1}{2}Pl + B$ |
| | Cylinder (lateral) | $S = 2\pi rh$ |
| | Cylinder (total) | $S = 2\pi rh + 2\pi r^2$ or $S = 2\pi r(h + r)$ |
| | Cone (lateral) | $S = \pi rl$ |
| | Cone (total) | $S = \pi rl + \pi r^2$ or $S = \pi r(l + r)$ |
| | Sphere | $S = 4\pi r^2$ |
| **Volume** | Prism or Cylinder | $V = Bh$ |
| | Pyramid or Cone | $V = \frac{1}{3}Bh$ |
| | Sphere | $V = \frac{4}{3}\pi r^3$ |
| **Special Right Triangles** | 30°, 60°, 90° | $x,\ x\sqrt{3},\ 2x$ |
| | 45°, 45°, 90° | $x,\ x,\ x\sqrt{2}$ |
| **Pythagorean Theorem** | | $a^2 + b^2 = c^2$ |
| **Distance Formula** | | $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ |
| **Slope of a Line** | | $m = \frac{y_2 - y_1}{x_2 - x_1}$ |
| **Midpoint Formula** | | $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$ |
| **Quadratic Formula** | | $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ |
| **Slope-Intercept Form of an Equation** | | $y = mx + b$ |
| **Point-Slope Form of an Equation** | | $y - y_1 = m(x - x_1)$ |
| **Standard Form of an Equation** | | $Ax + By = C$ |
| **Simple Interest Formula** | | $I = prt$ |



***Think Back***

- *In a function, the y-coordinate is described in terms of the x-coordinate.*
- *The value of y depends on the value of x.*
  - *y is the dependent variable.*
  - *x is the independent variable.*
  - *Sometimes y is written "f(x)"*

Consider the function $y = x^2 + 3$. Review the names of its parts.




A **constant** is a value that always stays the same. All numbers are constants. For example, 10, 3, -7, and 6.54 are constants.

***Example***

Name the independent quantity, the dependent quantity, and the constant(s) in the function $f(x) = 3x^4 - 2x + 7$.

***Solution***

Independent quantity: $x$

Dependent quantity: $f(x)$

Constants: 3, 4, -2, 7

**FACT**

*A minus sign in front of a number means that number is negative. No minus in front of a number means it is positive.*

In life, situations can be modeled by functions. Consider the next example.

***Example***

Name the independent quantity, the dependent quantity, and the constant(s) in the functional relationship:

Ramón visits an amusement park that charges $13 admission, plus $3 for each ride he goes on. Let *c* represent the total cost of visiting the park and riding *r* rides.

***Solution***

The number of rides Ramón goes on determines the total cost of the day, so the number of rides, *r*, is the independent quantity.

The total cost depends on the number of rides Ramón goes on. The total cost, *c*, is the dependent quantity.

The admission of the park will always be the same. $13 is a constant. The price per ride, $3, is a constant as well.


Name the independent quantity, the dependent quantity, and the constant(s) in the functional relationship.

**1)** $y = 4x$

Independent:

Dependent:

Constant(s):

**2)** $f(x) = 0.25x + 1$

Independent:

Dependent:

Constant(s):

**3)** Cindy hires a landscaping company to fertilize her garden. She pays $105 plus $1.19 for every pound of fertilizer used. Let $c$ be the total cost of hiring the company to spread $p$ pounds of fertilizer.

Independent:

Dependent:

Constant(s):

On the exam, you will be faced with word problems full of information. Not all the given information will be necessary to solve the problem. You must be able to sort the information and use only what is important.

***Example***

A baseball team is selling candy bars for a fund-raiser. The team paid $400 for the candy bars and will sell them for $1.50 each. The relationship between the number of bars sold and the team's profit from the sale of the candy bars can be represented by the function $f(b) = 1.5b - 400$, in which $b$ represents the number of candy bars sold.

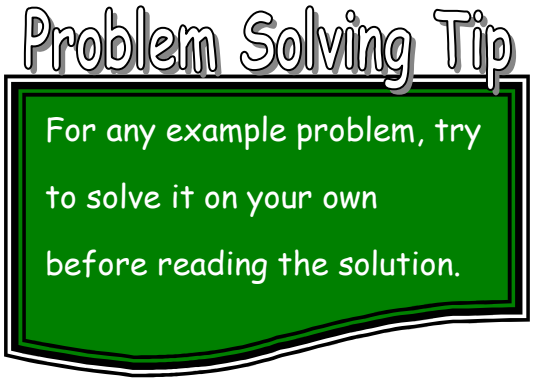
What is the dependent quantity in this functional relationship?

**A** The number of candy bars sold

**B** The selling price of the candy bars

**C** The team's profit from the candy bars

**D** The amount the team paid for the candy bars




***Solution***

(1) Read the entire question. Understand what you need to find.

- Find the dependent quantity.

(2) Recall what you know about the dependent quantity.

- It is represented by the $y$-value or $f(x)$ in a function.

(3) Read the question again. Pick out what is important to find the dependent quantity.

- $f(b)$ shows the relationship between profit and candy bars sold.
- $f(b) = 1.5b - 400$
- $b$ represents the number of bars sold.

(4) Use this information to answer the question.

- I know $f(b)$ is the dependent quantity. If $b$ is the number of candy bars, then $f(b)$ must represent the profit.

The answer is choice **C**.


**4)** A group is having a bake sale. Each baked good is sold for \$3. The group paid \$275 for ingredients and \$100 to rent a space to have the sale. The relationship between the number of baked goods sold and the group's profit from the bake sale can be represented by the function $f(x) = 3x - 375$, in which $x$ represents the number of baked goods sold. What is the independent quantity in this functional relationship?

**A** The price to rent the space

**B** The number of baked goods sold

**C** The group's profit from the sale

**D** \$3, the price of each baked good

You may need to create a function based on a relationship.

***Example***

Kate rents a car by the day. She pays a $200 fee and $120 for each day she uses the car. Let *c* represent the total cost of renting the car for *d* days. Write an equation that represents the dependent variable in terms of the independent variable.

***Solution***

Just as before, we first identify the dependent and independent quantities.

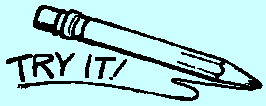
The number of days Kate rents the car determines how much she will pay. The number of days, *d*, is the independent quantity.

The total cost depends on the number of days she rents the car. Therefore, the total cost, *c*, is the dependent quantity.

The total cost is found by adding $200 to $120 times the number of days.

$$c = 120d + 200$$

Notice the fee ($200) and the daily rate ($120) are constants in the function. The value of *c* depends on the value of *d*.




**5)** Silvia takes her family out to the movie theater. She spends $29 to buy popcorn and soda. Movie tickets cost $9 each. Let *c* represent the total cost of taking *f* family members to the movies. Write an equation that represents the dependent variable in terms of the independent variable.

# Review

**Know these concepts:**

1. A function shows the dependence of one variable on another.
2. A function is written in terms of the independent variable.
3. All numbers are constants.
4. When reading a word problem:
   - **a.** Read it once to get a feel for the problem and to understand what it asks you to find
   - **b.** Read it again to gather what is important to answer the question.

# Practice Problems
## Lesson 2

Directions: Write your answers in your math journal. Label this exercise
TAKS Review – Lesson 2.

For questions 1 – 4, name the independent quantity, the dependent quantity, and the constant(s) in the functional relationship.

**1)** $y = \frac{x - 1}{3}$

**2)** $f(x) = x^2 + 5x - 7$

**3)** Rosie buys birdseed by the pound. She pays \$5 for each pound of birdseed. Let $m$ be the price of buying $p$ pounds of birdseed.

**4)** $p(n) = 2n^2 + 6n + 2$

**5)** The hockey team is ordering rubber bracelets to sell for a fund-raiser. The team will sell each bracelet for \$5. To order the bracelets, it cost the team \$210. The function to show the relationship between the team's profit and the number of bracelets sold is $f(n) = 5n - 210$ where $n$ represents the number of bracelets sold. What is the dependent quantity of this functional relationship?

**A** The price of ordering the bracelets

**B** The team's profit for selling the bracelets

**C** The price of each bracelet, \$5

**D** The number of bracelets sold


**1)** Independent: $x$
Dependent: $y$
Constant(s): 4

**2)** Independent: $x$
Dependent: $f(x)$
Constant(s): 0.25, 1

**3)** Independent: $p$, the number of pounds of fertilizer
Dependent: $c$, the total cost
Constant(s): \$105, \$1.19

**4)** **B**; $x$ is the independent variable and we are told within the question that $x$ represents the number of baked goods sold.

**5)** $c = 29 + 9f$ or $c = 9f + 29$

**End of Lesson 2**