

Using Graphs to Calculate (Education Pays)

<p>Objectives</p> <ul style="list-style-type: none"> • Students will interpret data from a bar graph. • Students will compute weekly and annual earnings. • Students will compare numbers and find differences. • Students will compute median earnings. • Students will be able to identify the relationship between education level and earning power by analyzing data from the Department of Labor. 	<p>Time frame to Complete</p> <p>2 hours</p>
<p>Standard(s) Addressed in Lesson</p>	<p>Using Math to Solve Problems and Communicate</p>
<p>Benchmark(s) Addressed in Lesson</p>	<p>M.4.2; M.4.16; M.4.22; M.4.26; M.4.28; M.4.31</p>
<p>Materials</p> <ul style="list-style-type: none"> • Post It Notes or small pieces of paper • File cards • “Academic and Employment Credentials” definitions (available in the Resource section on page 121) • “Education Pays” bar graph from Bureau of Labor Statistics (http://www.bls.gov/emp/ep_chart_001.htm) • Lesson worksheet • Calculators • <i>Contemporary’s Number Power Review</i> page 50-51 is a good workbook lesson to introduce median or to extend the concept before or after this lesson. <p>Note: This math lesson should follow the math lesson on “Known Relationships” which introduces or reviews the concept of annual and introduces students to writing mathematical equations. This lesson should follow the reading lesson on “Career Pathways” which reviews definitions of academic and employment credentials in relationship to hourly salary.</p>	
<p>Activities</p> <p><u>Warm –up:</u> Review median. Give each student a post it note or small piece of paper. Have them write the age they would most like to be. Have students arrange the notes on the board or on a table in numerical order and show them how to determine the median.</p> <p>Explain the rules for finding median:</p> <ul style="list-style-type: none"> • If a set contains an odd number of numbers, the median is the middle number. • If a set contains an even number of numbers, the median is the average of the two middle numbers. <p>Demonstrate both concepts using the data the class provided. Add yourself as needed to start with an odd number of post-it notes for the first demonstration and an even number for the second demonstration. Think aloud and model how to find the median with the data set from the class.</p> <p>Write the rules for finding median on the board and have students copy them on a file card to refer to as they solve the problems on the lesson worksheet.</p>	

Step 1: Explain to the class that we are going to work with the concept of median as we analyze data from the Department of Labor that shows the relationship of education level to earnings power. The data is presented in a bar graph. We will read and understand the bar graph and use the data to make a chart. A chart is another way to display data. We will review and compute measurement concepts of weekly, monthly, annually. We will also practice computing median.

Step 2: Pass out the “Education Pays” graph. Review the bar graph with the students. What is the graph about? What are the labels for the bar graphs? Review vocabulary as needed so students understand the educational levels. Pass out the Academic and Employment Credentials definitions. Review the definitions with the students. (You may have already done this if you did the math lesson “More Education Means More Money”)

Discuss the visual impact of the bar graph. What catches their attention? Discuss the impact of the bars as well as the numbers.

Why do they think the Department of Labor chose to display median weekly earnings for full time wage and salary workers age 25 and over? Why not include younger and part time workers? Why median and not average?

Step 3: Have the students read the bar graph to complete the far left column of the chart for median weekly earnings by reading the bar graph. Discuss how the numbers remain the same but communicating the numbers has changed from the bar graph format to the chart format. Compare the two forms of mathematical communication.

Discuss how it is beneficial to look at the same proportion in different ways. Eighty dollars more per week may not sound like as much as four thousand dollars a year. Have students estimate the 30 year projected income for someone with an associate’s degree. Have them write their estimate off to the side of the chart and tell them to compare it to the actual computation as they complete the chart.

Step 4: Have students use a calculator and do the last row of the chart together showing students with less than a high school diploma. Discuss how to convert median weekly earnings to annual earnings. Discuss how the parentheses are used to write the mathematical expressions in the examples. Discuss how to determine the projected income for the 30 year period. Have students use a calculator to complete the chart with a partner.

Step 5: Practice reading the large numbers on the chart with the students. How close was their estimate of the 30 income someone with an associate’s degree? Does anything surprise them?

Step 6: Have students complete the worksheet “Education Pays.” Depending on the levels of the students, the worksheet can be done with the teacher leading the class or in small groups. The worksheet could be completed again independently at a later date for the students’ portfolios.

Step 7: Review the worksheet with the students. Have them speculate why the median salary of the class in question 2 is lower than the weekly salary in the Bureau of Labor Statistics. Are they surprised at the increase in earnings when a student continues her education? Why is it a good exercise to look at hourly, weekly, annual earnings and also projected earnings over a period of time? Discuss how earning more money can generate even additional income over the 30 year period by saving money that earns interest and by investing. What is the advantage of investing in education? Other than income how else do people benefit by increasing education? Why do they think the unemployment rates are higher for people with less education?

Assessment/Evidence

Completed worksheet for students' portfolios documents reading a bar graph and chart and computing difference and computing median.

Adaptations for Beginning Students

Complete more parts of the chart ahead of time so students have fewer problems to do. The projected income column could also be removed.

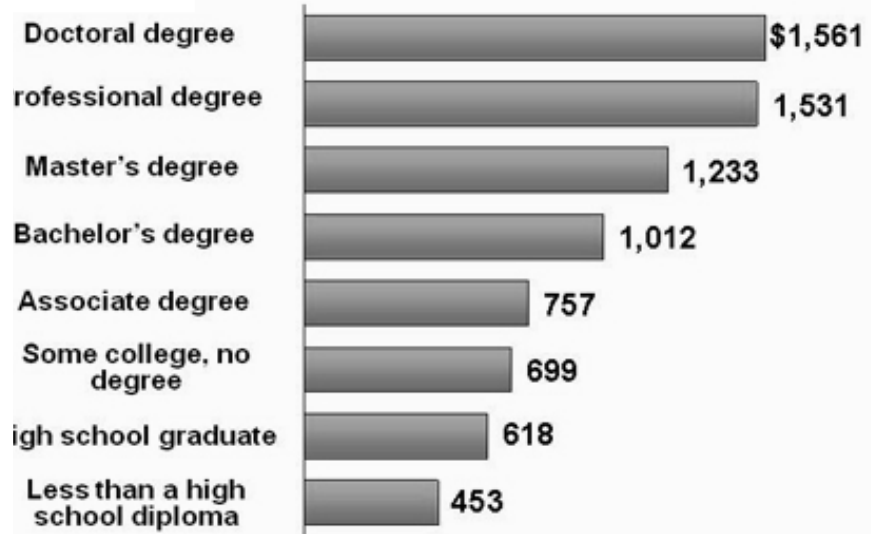
Adaptations for Advanced Students

Have students compute hourly wages based on the weekly median wages for each educational level. Students can divide the median weekly wage by 40. They will round to the nearest cent to determine an hourly wage for each educational level.

Education pays



Median weekly earnings in 2008



Use the bar graph above and a calculator to fill in chart below:

Education Attained	Median weekly earnings in 2008 (dollars)	Annual earnings in 2008 (dollars), (paid sick leave and vacation)	Projected Income over 30 year period (paid sick leave and vacation)
Doctorial degree		\$81,172	\$2,435,160
Professional degree		\$79,612	\$2,388,360
Master's degree		\$64,116	\$1,923,480
Bachelor's degree			
Associate degree			
Some college, no degree			
High school graduate			
Less than a high school diploma	\$453	$(\$453)(52) = \$23,556$	$(\$453)(52)(30) = \$706,680$

Data is for persons age 25 and over. Earnings are for full-time wage and salary workers.
Source: Bureau of Labor Statistics, Current Population Survey

Education Pays

Name _____

Use your completed table and the bar graph "Education Pays" to answer the following questions:

1. There are five students in the morning GED class who are employed full time. The hourly wages of the employed students are \$7.85, \$12.00, \$8.50, \$9.75, and \$21.45. What is the median hourly wage of the five employed students in this GED class?
2. What is the median weekly wage of the employed students in this GED class? (All students have 40 hour per week full time jobs.)
3. How much higher or lower is the median weekly wage of this morning GED class compared to the median weekly earnings in the Bureau of Labor Statistics 2008 population survey?
4. There are eight students in the evening GED class who are employed full time. Their hourly wages are \$7.80, \$11.45, \$13.50, \$9.50, \$20.25, \$8.75, \$10.50, \$12.45. What is the median hourly wage of the employed students in this GED class?
5. According to the Department of Labor Statistics a student who obtains her GED to complete her high school education can expect her median weekly earnings to increase by how much?
6. By how much are her earnings expected to increase annually when she completes her high school education?
7. If the same student continues her education to obtain an associate's degree, how much more money can she expect to earn working full time for thirty years compared to working full time for thirty years without a high school diploma?

Answer Key: Education Pays

Education Attained	Median weekly earnings in 2008 (dollars)	Annual earnings in 2008 (dollars), (paid sick leave and vacation)	Projected Income over 30 year period (paid sick leave and vacation)
Doctorial degree	\$1,561	\$81,172	\$2,435,160
Professional degree	\$1,531	\$79,612	\$2,388,360
Master's degree	\$1,233	\$64,116	\$1,923,480
Bachelor's degree	\$1,012	\$52,624	\$1,578,720
Associate degree	\$757	\$39,364	\$1,180,920
Some college, no degree	\$699	\$36,348	\$1,090,440
High school graduate	\$618	\$32,136	\$964,080
Less than a high school diploma	\$453	$(\$453)(52) = \$23,556$	$(\$453)(52)(30) = \$706,680$

- There are five students in the morning GED class who are employed full time. The hourly wages of the employed students are \$7.85, \$12.00, \$8.50, \$9.75, and \$21.45. What is the median hourly wage of the five employed students in this GED class? **\$9.75**
- What is the median weekly wage of the employed students in this GED class? (All students have 40 hour per week full time jobs.) **$\$9.75(40) = \390.00**
- How much higher or lower is the median weekly wage of this morning GED class compared to the median weekly earnings in the Bureau of Labor Statistics 2008 population survey? **$\$453 - \$390 = \$63.00$ lower**
- There are eight students in the evening GED class who are employed full time. Their hourly wages are \$7.80, \$11.45, \$13.50, \$9.50, \$20.25, \$8.75, \$10.50, \$12.45. What is the median hourly wage of the employed students in this GED class? **$7.80, 8.75, 9.50, 10.50, 11.45, 12.45, 13.50, 20.25 = \10.98**
- According to the Department of Labor Statistics a student who obtains her GED to complete her high school education can expect her median weekly earnings to increase by how much? **\$165.00**
- By how much are her earnings expected to increase annually when she completes her high school education? **\$8,580**
- If the same student continues her education to obtain an associate's degree, how much more money can she expect to earn working full time for thirty years compared to working full time for thirty years without a high school diploma? **$\$1,180,920 - 706,680 = \$474,240$**