Activity 8.1A

Connections to the mathematics TEKS

(8.1) The student understands that different forms of numbers are appropriate for different situations.

The student is expected to:

(A) compare and order rational numbers in various forms including integers, percents, and positive and negative fractions and decimals

The teacher posts an unlabeled, classroom-size number line marked with the benchmarks -2, -1, -1/2, 0, 1/2, 1, and 2. The teacher provides students with a variety of rational numbers (in fractional and decimal form) written on note cards. Students put the note cards in the appropriate places on the number line.

Questioning...

Open with...

What strategies could you use to help you locate these numbers on the number line?

Probe further with...

- Which of these numbers are greater than zero? Less than zero?
- Which numbers are between 0 and 1? How do you know?
- Which are between 0 and -1? How do you know?
- Which are between 1 and 2? How do you know?
- Is there a way to locate the equivalent of 100% on the number line?
- Is there a way to locate the equivalent of 40% on the number line?

Listen for...

- Can the student describe numbers using multiple representations to help locate their positions on the line? (For example, .25 = 1/4.)
- Does the student use benchmarks to help determine locations for numbers? (For example, 3/8 is less than 1/2; 40% is less than 50%, etc.)

- Does the student convert to other representations—such as changing fractions to decimals—to determine placement?

Look for...

- Does the student place benchmarks at the appropriate points?
- Does the student place positive and negative numbers on the appropriate side of zero on the number line?
- Does the student recognize that the negative value of a number is the same distance away from zero as its positive value?
- Does the student recognize that every value other than zero has an opposite value that could be assigned?

TAKS Connection

10 The chart shows the elevations of the lowest points in 4 states and the District of Columbia.

Lowest Points

Location	Elevation (in feet)
Arkansas	55
California	–282
District of Columbia	1
Louisiana	–8
Virginia	95

Which list shows the elevations in order from least to greatest?

F −8 ft, −282 ft, 1 ft, 55 ft, 95 ft

G 1 ft, −8 ft, 55 ft, 95 ft, −282 ft

H −282 ft, −8 ft, 1 ft, 55 ft, 95 ft

J −282 ft, 95 ft, 55 ft, −8 ft, 1 ft

Activity 8.1B

Connections to the mathematics TEKS

(8.1) The student understands that different forms of numbers are appropriate for different situations.

The student is expected to:

(B) select and use appropriate forms of rational numbers to solve real-life problems including those involving proportional relationships

The teacher provides students with real-life situations that involve comparing numbers and computing costs. Students work together to determine solutions.

For example, Diane, Jim, and Cindy bought a large pizza with 16 slices. Diane ate 25% of the pizza, Jim ate 6 slices, and Cindy ate 1/8 of the pizza. Who ate the most pizza and how do you know? The cost of the pizza is $1.25 for every two slices. How much should each person pay?

Questioning...

Open with...

Describe the different ways you could choose to represent the portion of the pizza each person ate.

Probe further with...

- Why do you think it's appropriate to use the representations you selected?
- In what situations is it most appropriate to give a response in fractional form? Decimal form? As a percentage?
- How might other representations be used to solve the problem?
- How did you determine the cost of the pizza each person ate?

Listen for...

- Can the student justify the selected number form?
- Does the student use appropriate vocabulary for representing numbers in different forms?

Look for...

- Does the student use different number forms appropriately (fractions, percentages, decimals, proportions, etc.)?
- Does the student correctly convert numbers from one form to another?
- What strategy does the student use to convert numbers from one form to another?
- What methods does the student use to find the cost?

TAKS Connection

33 It is estimated that 90% of an iceberg's volume is underwater. If 100 cubic meters of an iceberg is above water, approximately how much ice is underwater?

A $10\ m^3$

B $90\ m^3$

C $190\ m^3$

D $900\ m^3$

E $1000\ m^3$

Activity 8.1C

Connections to the mathematics TEKS

(8.1) The student understands that different forms of numbers are appropriate for different situations.

The student is expected to:

(C) approximate (mentally and with calculators) the value of irrational numbers as they arise from problem situations (π, $\sqrt{2}$)

The student is given a piece of 5 x 5 dot paper. Students are asked to draw squares of every size possible (including tilted squares, there are 8 possible squares). A vertex of the square must be one of the dots. (The length of sides of possible squares on a 5 x 5 grid are: 1, √2, 2, √5, √8, 3, √10, and 4.) (Note: Students may want to explore first on a geoboard.)

The student is given a number line with intervals that are equal to the intervals on the dot paper. The student is asked to cut out all the possible squares and place them on the number line. Using the information obtained from the number line, students are asked to approximate the length of the sides of each square.

Students will verify their approximations of square roots using a calculator.

Questioning...

Open with...

Describe the squares that you found.

Probe further with...

- Can you find more squares?
- What are some other ways you can draw a square in this area?
- Is there a difference between the tilted and non-tilted squares when you place them on the number line?
- Where do the tilted squares fit on the number line?
- How do you know if you have all the squares?

Listen for...

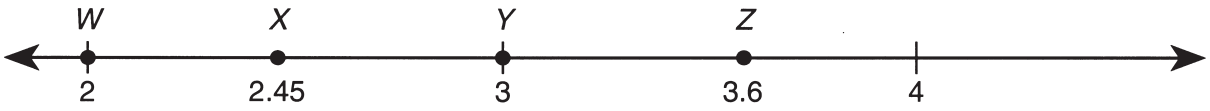
- Does the student verify the value of the square root to its placement on the number line?
- Can the student describe a systematic approach for finding all the squares?

Look for...

- Does the student include tilted squares?
- Is the student placing the numbers correctly on the number line?
- Does the student use a systematic method for finding all the squares?

TAKS Connection

1 Which point on the number line best represents $\sqrt{6}$?



A *W*
B* *X*
C *Y*
D *Z*

Students should realize that $\sqrt{4} = 2$ and $\sqrt{9} = 3$ and therefore $\sqrt{6}$ should be between 2 and 3.

Activity 8.1D

Connections to the mathematics TEKS

(8.1) The student understands that different forms of numbers are appropriate for different situations.

The student is expected to:

(D) express numbers in scientific notation, including negative exponents, in appropriate problem situations using a calculator

Students look through newspapers and magazines or their science textbooks for examples of very large or very small numbers. Students are then asked to express these numbers in scientific notation. The students then post their examples on a bulletin board. After all examples are displayed the class compares and contrasts the numbers.

Students should enter the standard notation of each number into a calculator and discuss the displayed answers. (The student may need to press <enter> or <equal> so that the number changes to scientific notation. Additionally, calculators may have to be fixed to a certain decimal point in order to allow students to see the scientific notation.)

Questioning...

Open with...

What did you do to write the numbers in scientific notation? How does your written answer compare to what the calculator displays?

Probe further with...

- Do you see a way to group these numbers?
- What do some of these numbers have in common?
- How do you determine if these numbers are equivalent?
- What are the place values of specific digits?
- What is the purpose of the exponent?
- How is scientific notation displayed on the calculator?
- What are the parts of the number that are displayed on the calculator?
- Why would you write some numbers in scientific notation?

Listen for...

- Can the student differentiate between very large and very small numbers?
- Does the student recognize various representations of numbers?
- Does the student use the calculator appropriately?
- If the calculator does not show the number in scientific notation, can the student write the scientific notation?
- If the calculator does show the number in scientific notation, can the student read it?

Look for...

- Are the numbers in scientific notation?
- Is the power of ten used correctly?
- Does the student recognize the difference between positive and negative exponents?
- Does the student use the calculator appropriately?

TAKS Connection

14 According to the 1980 census, the U.S. population was 227,757,000. What is this number expressed in scientific notation?

F 2.27757×10^{-9}

G 2.27757×10^{-8}

H 2.27757×10^{8}

J 2.27757×10^{9}

Activity 8.2A

Connections to the mathematics TEKS

(8.2) The student selects and uses appropriate operations to solve problems and justify solutions.

The student is expected to:

(A) select and use appropriate operations to solve problems and justify the selections

Students create a restaurant menu and write problems that include addition, subtraction, multiplication, and division. For example, students can find each person's cost for a given meal with a 20% discount, 8.25% tax, and 15% tip that is shared equally among all members of the group. Students provide an explanation of the solution process, including decisions such as whether the tip was figured before the discount and tax or after.

Questioning…

Open with...

What strategy could you use to determine your bill?

Probe further with…

- Can you estimate your bill?
- How was the total generated?
- What different strategies can be used to calculate a tip?
- How did you determine the discount?
- When should you calculate the tax? The tip? Does it make a difference?
- What strategies could you use to estimate the tip, tax, and total bill for each person if the bill were split equally?

Listen for...

- Does the student verbalize the strategy using appropriate vocabulary?
- Does the student accurately describe a procedure to find the total price?
- Does the student know to add the tax and tip to the bill?
- Does the student subtract the discount?
- Is the student using estimation skills to verify results?
- When computing tax is the student rounding the answer correctly?

Look for…

- Does the student perform the various calculations correctly?
- What strategies did the student use?
- Is the student selecting and using appropriate operations to solve the problem?
- Is the student justifying his or her strategies and solutions?
- Does the student deal correctly with percentages?

TAKS Connection

26 There are 14 soccer teams in the youth division of the Midvale Youth Soccer League. The league plans to add 2 more teams every 2 years until the total number of teams reaches 20. How many years will it take to reach that goal?

F 3 yr

G 6 yr

H 10 yr

J 12 yr

K 16 yr

Activity 8.2B

Connections to the mathematics TEKS

(8.2) The student selects and uses appropriate operations to solve problems and justify solutions.

The student is expected to:

(B) add, subtract, multiply, and divide rational numbers in problem situations

Students are divided into groups. Each group is given a selection of local newspaper sale advertisements. The students make decisions about what to purchase given a certain amount of money to spend. Calculations should include actual prices, sale prices, discounts (percentages), taxes, and other factors. Each group shares their results with the class, including what purchases they decided to make and why.

Questioning...

Open with...

Explain your strategy for determining the choices and calculations you made.

Probe further with...

- What strategies can you use to determine the amount of your purchases?
- What did you purchase with your money?
- How much money did you spend?
- How much money did you have left?
- How would a discount affect your purchases?

Listen for...

- Can the student verbalize the strategies used?
- How does the student decide what to spend?
- Can the student describe the process correctly for finding the discount? Tax? Final price?

Look for...

- Does the student perform the calculations correctly?
- Does the student justify his or her decisions?

TAKS Connection

55 Zelda's punch recipe called for 3 quarts of soda and $2\frac{1}{2}$ quarts of fruit juice. She had 1 gallon of each ingredient. After she mixed 1 batch of punch, how many ***quarts*** of fruit juice did she have left?

A 1 qt

B $1\frac{1}{2}$ qt

C $2\frac{1}{2}$ qt

D $5\frac{1}{2}$ qt

E Not Here

Activity 8.2C

Connections to the mathematics TEKS

(8.2) The student selects and uses appropriate operations to solve problems and justify solutions.

The student is expected to:

(C) evaluate a solution for reasonableness

Students consider the following situation:

> In the first half of the baseball season, Stan gets 65 hits out of 253 times at bat. In the second half of the season, Stan gets 70 hits out of 284 times at bat. What is his batting average for the entire season?

Students discuss whether the sum of his batting averages for the two halves of the season (0.257 + 0.246 = 0.503) is a reasonable answer to the question.

(Since a batting average is the ratio of hits to times at bat, 0.503 means that the player hit the ball over half of the times at bat, so it is not a reasonable answer. Stan's batting average for the entire season is (65 + 70)/(253 + 284).)

Questioning...

Open with...

What do the numbers 0.257, 0.246, and 0.503 mean?

Probe further with...

- If Stan's batting average were 0.503, what does that mean about how he performed?
- How were 0.257 and 0.246 computed?
- What is Stan's batting average for the season?
- If Stan were at bat 10 times in one game, how many hits would you expect him to have?
- Is the sum method of calculating Stan's average for the entire season reasonable?
- Why do you get different answers?

Listen for...

- Is the student able to correctly explain the meaning of batting average?
- Does the student understand the difference between adding the two ratios and computing the ratio for the entire season?

Look for...

- Does the student use the decimal representation correctly?
- How does the student compute the ratio and divide and round to get the decimal value?

TAKS Connection

41 During a field trip to a beach, Mrs. Wong's class collected seashells. There were 11 boys and 14 girls in her class. The least number of seashells collected by a student was 12, and the greatest number was 18. Which is a reasonable total number of shells collected by all the students?

A 132

B 252

C 372

D 492

E 612

Activity 8.2D

Connections to the mathematics TEKS

(8.2) The student selects and uses appropriate operations to solve problems and justify solutions.

The student is expected to:

(D) use multiplication by a constant factor (unit rate) to represent proportional relationships; for example, the arm span of a gibbon is about 1.4 times its height, a = 1.4h

Students use the scale of a map to calculate the relationship between the distance on the map and the actual distance between two points. For example, if a scale on a map reads that 1 inch = 3 miles, then the number of miles between the two points (real distance) is three times the number of inches on the map (map distance), or real distance = 3(map distance). Students then use this relationship to find real distances between given points on the map, or to extend the map further while maintaining the same scale.

Questioning...

Open with...

How did you use the scale on the map to determine the actual distances?

Probe further with...

- What is the scale on the map?
- What does this represent?
- Is there more than one way to use the scale to find the actual distance?
- How can you use the scale to determine actual distance?

Listen for...

- Does the student verbalize the relationship between the map scale and actual distance?
- Does the student make a generalization about finding distance?

Look for...

- Does the student correctly determine the distances?
- Does the student always refer to the original scale or does he or she use an equivalent form to determine values?
- Does the student use the constant factor (the scale) to find distance?
- What operations does the student use?

TAKS Connection

3 On average, a child's heart rate in beats per minute is faster than an adult's heart rate by a factor of about 1.2. Given a, an adult's heart rate, which equation can be used to find c, a child's heart rate?

A $c = 1.2 \div a$

B $c = a \div 1.2$

C $c = 1.2 + a$

D* $c = 1.2a$