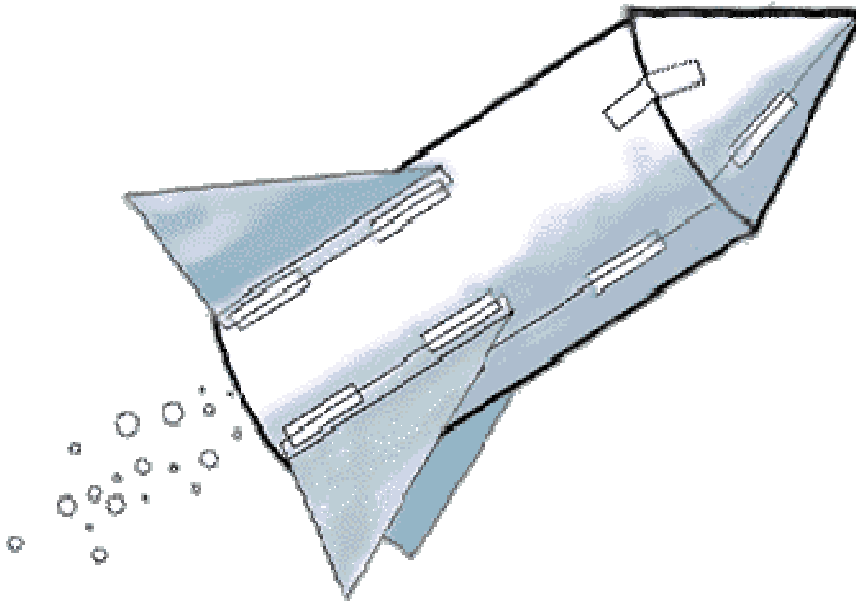


STEM CIP

Science/Technology/Engineering/Mathematics
Curriculum Integration Project

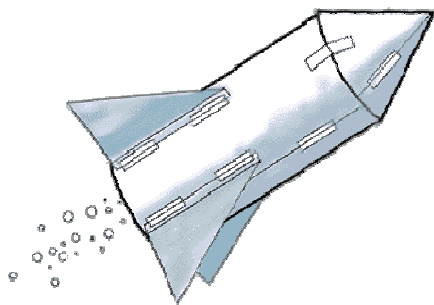


3-2-1 Lift Off

Student Data and
Response Booklet

Name _____





Effervescent Tablet Rocket

Table of Contents

	Page
Mathematics Readiness Assessment.....	1
Do You Already Know This Science?.....	11
Engagement: Let's Soar.....	13
Activity 1: Dissolving Materials.....	14
Activity 2: Alka-Seltzer and Water.....	15
Check Your Understanding	16
Activity 3: Temperature and Dissolving Time	18
Check Your Understanding	22
Activity 4: Particle Size and Dissolving Time.....	23
Check Your Understanding	28
Activity 5: Different Liquids and Dissolving Time.....	29
Check Your Understanding	34
Activity 6: What is Form and Function?	35
Activity 7: Engineering Your Rocket	36
Activity 8: Engineering Your Rocket: Redesign and Launch Day	38
Check Your Understanding	39
Activity 9: What Goes Up Must Come Down.....	40
Check Your Understanding	41
Activity 10: What Might Affect Gravity?.....	43
Check Your Understanding	44
Activity 11: Rhythms of Gravity	45
Check Your Understanding	48
Scoring Rubrics	
Alka-Seltzer Rocket Design Rubric.....	50
Scientific Drawing	51
Graphing Scientific Data.....	52
Brief Constructed Response to Open Ended Science Questions.....	53

Mathematics Readiness Assessment

- 1. What is the most appropriate type of graph to best display the favorite ice cream of the students in the fifth grade?**
 - A. Line graph
 - B. Bar graph
 - C. Pictograph
 - D. Stem and leaf plot
- 2. What is the most appropriate type of graph to best display the number of home runs hit by Cal Ripken per year over five years?**
 - A. Line graph
 - B. Bar graph
 - C. Pictograph
 - D. Stem and leaf plot
- 3. Bobby is conducting an experiment to prove that the spinner he and his friends used to play a board game is unfair. He decides to spin the spinner 50 times to find out which color is landed on most often: yellow, green, red or blue. Each time Bobby spins the spinner, he records the outcome on a graph. What type of graph should Bobby create so that he can record data as he is conducting the experiment?**
 - A. Line graph
 - B. Bar graph
 - C. Line Plot
 - D. Stem and leaf plot

Use the stem and leaf plot below to answer questions 4 and 5.

Hours of TV Watched By Students in Mr. Smith's Class in One Week

0		3 5 6 6 9
1		0 0 1 4 4 4 8 9 9
2		2 3 4 7 7 7 8
3		1 1 5
4		9

Key: 2|3 = 23 hours

Mathematics Readiness Assessment

4. What is the total number of hours of TV watched by the students in Mr. Smith's class?

- A. 10
- B. 49
- C. 472
- D. 482

5. How many students watched more than 18 hours of TV in one week?

- A. 2
- B. 3
- C. 11
- D. 13

The following chart displays the amount of time Mr. Kelly's students listen to music each month. Use this chart to answer questions 6 – 8.

Hours Spent Listening to Music on One Month

Student	Tony	Connie	Luke	Yoshi	Francis
Hours Per Month	72	107	107	86	53

6. What is the mode?

- A. 19
- B. 85
- C. 86
- D. 107

7. What is the mean?

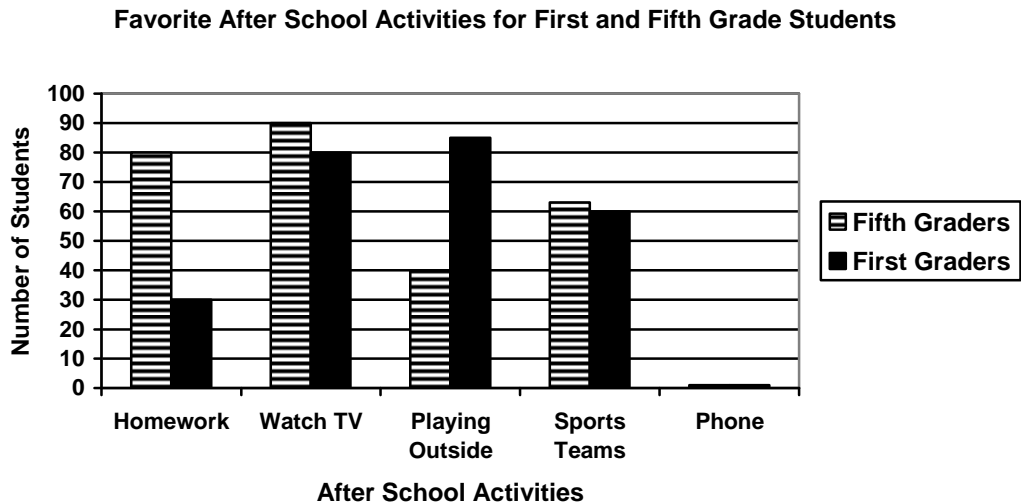
- A. 19
- B. 85
- C. 86
- D. 107

8. What is the median?

- A. 19
- B. 85
- C. 86
- D. 107

Mathematics Readiness Assessment

Use the following graph to answer questions 9 – 11.



9. In which after school activity did the first graders have more students?
- A. Homework
 - B. Watch TV
 - C. Playing Outside
 - D. Phone
10. About how many more fifth grade students than first grade students liked homework?
- A. 30
 - B. 50
 - C. 80
 - D. 110
11. About how many more first grade students than fifth grade students liked playing outside and sports teams?
- A. 30
 - B. 35
 - C. 39
 - D. 45

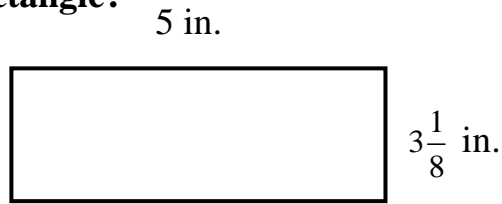
12. Which formula would you use to find the perimeter of the square below?

- A. $P = 4 \times S$
- B. $P = S^2$
- C. $P = S \times S$
- D. $P = 2 \times S$



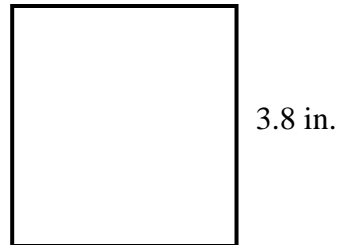
13. What is the perimeter of this rectangle?

- A. $15\frac{5}{8}$ in.
- B. $15\frac{5}{8}$ in.²
- C. $16\frac{1}{4}$ in.
- D. $16\frac{1}{4}$ in.²



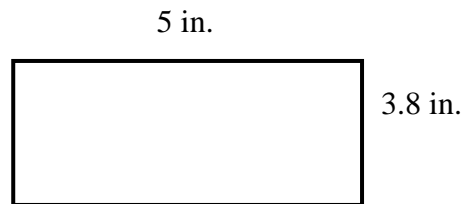
14. What is the perimeter of this square?

- A. 6.8 in.
- B. 11.4 in.
- C. 14.4 in.
- D. 15.2 in.



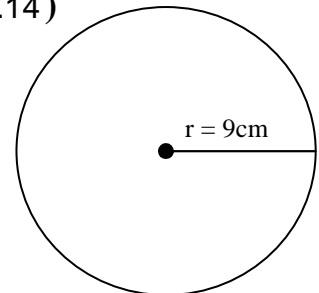
15. What is the area of this rectangle?

- A. 8.8 in.²
- B. 17.6 in.²
- C. 19 in.²
- D. 38 in.²



16. What is the circumference of the following circle? ($\pi = 3.14$)

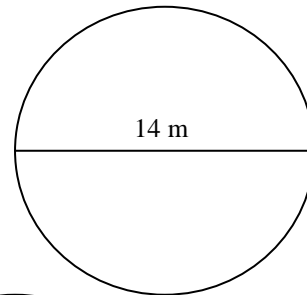
- A. 18.00 cm
- B. 28.26 cm
- C. 52.56 cm
- D. 56.52 cm



Mathematics Readiness Assessment

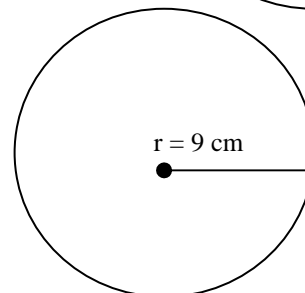
17. What is the circumference of the following circle? ($\pi = 3.14$)

- A. 17.14 m
- B. 28.00 m
- C. 43.96 m
- D. 87.92 m



18. What is the area of the following circle? ($\pi = 3.14$)

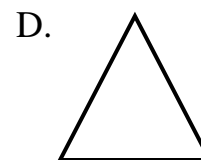
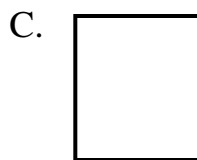
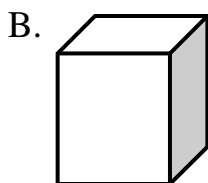
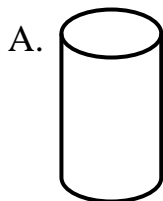
- A. 56.52 cm²
- B. 84.78 cm²
- C. 113.04 cm²
- D. 254.34 cm²



19. Which unit is NOT a measure of volume?

- A. cm²
- B. cm³
- C. liter
- D. ft³

20. Which figure is a rectangular prism?



21. Each side of a cube measures 7 mm. What is the volume of the cube?

- A. 42 mm³
- B. 49 mm³
- C. 294 mm³
- D. 343 mm³

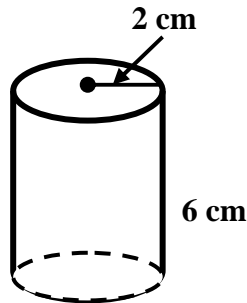
22. A rectangular prism measures 2 m wide, 3 m high and 18 m long. What is its volume?

- A. 23 m³
- B. 90 m³
- C. 108 m³
- D. 192 m³

Mathematics Readiness Assessment

23. What is the volume of the cylinder to the nearest tenth? Use $\pi = 3.14$.

- A. 25.1 cm^3
- B. 37.7 cm^3
- C. 75.4 cm^3
- D. 301.4 cm^3



24. What is the total surface area of a rectangular prism that measures 3 feet by 4 feet by 6 feet?

- A. 13 ft^3
- B. 13 ft^2
- C. 72 ft^2
- D. 108 ft^2

25. What is the total surface area of a cube that measures 8 meters on each side?

- A. 64 m^2
- B. 256 m^2
- C. 384 m^2
- D. 512 m^2

26. What is the total surface area of the cylinder to the nearest tenth? Use $\pi = 3.14$.

- A. 25.12 cm^2
- B. 75.36 cm^2
- C. 100.48 cm^2
- D. 150.72 cm^2

Mathematics Readiness Assessment

Use the following train schedule to answer questions 27 – 29.

Train Schedule		
Arrives	Departs	City
7:40 pm	7:50 pm	Toledo, OH
11:07 pm	11:15pm	Cleveland, OH
3:25 am	3:35 am	Buffalo, NY
9:05 am	9:35 am	Albany, NY

27. How long must a train travel to get from Toledo to Cleveland?

- A. 3 hrs 7 min
- B. 3 hrs 17 min
- C. 4 hrs 7 min
- D. 4 hrs 17 min

28. Which conversion is correct?

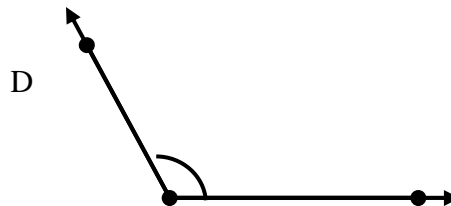
- A. 3 yds = 12 ft
- B. 7 hrs = 420 sec
- C. 15 cm = 180 mm
- D. 2 ½ hrs = 150 min

29. What is the elapsed time from 3:35 am to 9:05 am?

- A. 5 hrs 30 min
- B. 6 hrs 10 min
- C. 6 hrs 30 min
- D. 6 hrs 40 min

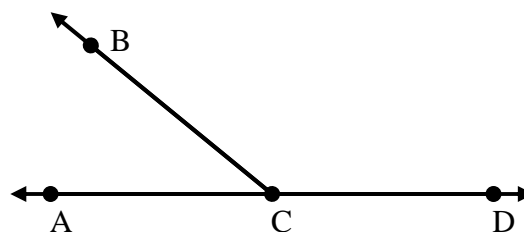
30. What is the measure of $\angle DEF$?

- A. 65°
- B. 75°
- C. 115°
- D. 125°



31. What is the measure of $\angle BCD$?

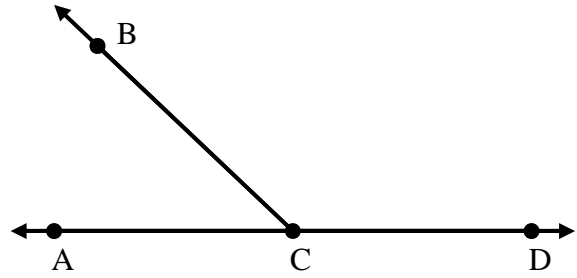
- A. 45°
- B. 55°
- C. 115°
- D. 135°



Mathematics Readiness Assessment

32. What is the measure of $\angle ACB$?

- A. 45°
- B. 55°
- C. 115°
- D. 135°



33. What is the value of the expression $x + 32$, when $x = 18$?

- A. 14
- B. 16
- C. 40
- D. 50

34. What is the value of the expression $2L + 2W$ when $L = 16$ and $W = 12$?

- A. 28
- B. 32
- C. 56
- D. 192

35. A car traveled at 35 mph for $3\frac{1}{2}$ hours. What is the distance the car traveled? Use the formula $d = r \cdot t$. Round your answer to the nearest whole number.

- A. 38 miles
- B. 39 miles
- C. 105 miles
- D. 123 miles

36. What are the values for “x” and “y”?

Hours Worked (h)	1	2	3	4	80	y
Toys Produced (p)	4	8	12	16	x	400

- A. $x = 32$ $y = 81$
- B. $x = 160$ $y = 1600$
- C. $x = 20$ $y = 100$
- D. $x = 320$ $y = 100$

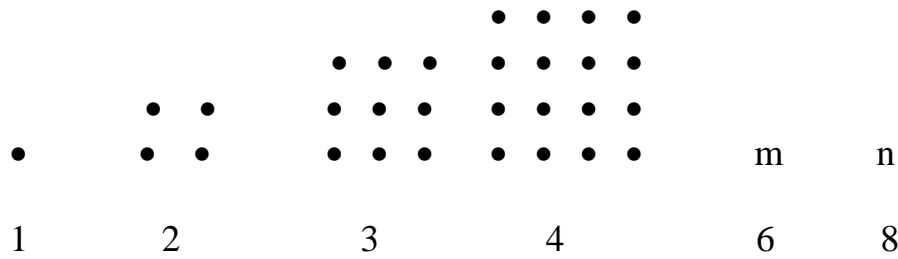
Mathematics Readiness Assessment

37. What are the values for “a” and “b”?

Days (d)	1	2	3	4	5	6	7
Total Spiders (t)	14	28	56	112	224	a	b

- A. a = 336 b = 448
- B. a = 336 b = 560
- C. a = 448 b = 886
- D. a = 448 b = 896

38. How many dots are needed for drawing m and n?



- A. m = 12 n = 16
- B. m = 25 n = 36
- C. m = 36 n = 64
- D. m = 36 n = 128

39. Which answer describes how a change in “x” results in a change in “y”?

x	2	4	6	8	10
y	10	20	30	40	50

- A. as “x” increases by 2, “y” increases by 10
- B. as “x” increases by 2, “y” doubles
- C. as “x” doubles, “y” doubles
- D. as “x” doubles, “y” increases by 10

Mathematics Readiness Assessment

40. Which answer describes how a change in “a” results in a change in “y”?

a	5	10	15	20	25
y	11	21	31	41	51

- A. as “a” increases by 5, “y” doubles
- B. as “a” increases by 5, “y” doubles minus one
- C. as “a” increases by 5, “y” increases by ten
- D. as “a” increases by 5, “y” increases by eleven

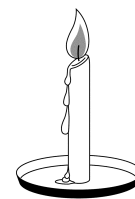
41. Which answer describes how a change in “b” results in a change in “t”?

b	64	32	16	8	4
y	4	8	12	16	20

- A. as “b” is multiplied by 2, “t” is multiplied by 2
- B. as “b” is divided by 2, “t” is multiplied by 2
- C. as “b” is multiplied by 2, “t” is increased by 4
- D. as “b” is multiplied by $\frac{1}{2}$, “t” is increased by 4

“Do You Already Know This Science?”

- 1. What is the name given to the form of energy when a rocket is launched and in motion?**
 - A Kinetic Energy
 - B Potential Energy
 - C Electrical Energy
 - D Magnetic Energy
- 2. What is the force that brings a rocket down to Earth?**
 - A Gravity
 - B Velocity
 - C Electrical
 - D Magnetism
- 3. The four objects listed below are resting on a table top four feet above the floor. Which one of the objects has the greatest potential energy?**
 - A baseball
 - B golf ball
 - C ping pong ball
 - D bowling ball
- 4. Jane stands motionless on her skateboard. Timmy decides to give the skateboard a push. Which of Newton’s Laws is best demonstrated by Timmy’s push on the motionless skateboard?**
 - A An object at rest will stay at rest until acted upon by a force
 - B A force of gravity exists between any two objects that have mass.
 - C An object acted upon by a force will accelerate in the direction of the force.
 - D Forces act in equal but opposite pairs so that for every action there is an equal but opposite reaction.
- 5. As a candle burns, you observe both chemical and physical changes taking place. Which statement best describes evidence for a physical change?**
 - A The flame releases light.
 - B The flame produces heat.
 - C The flame gives off black smoke.
 - D The flame causes the wax to melt.



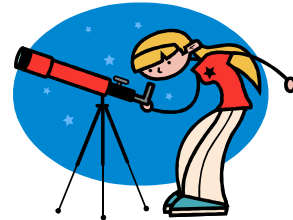
Do You Already Know This Science?

6. **In a scientific investigation, the procedure is**
- A a step-by-step plan for the investigation.
 - B the organizing of the data into data tables and graphs.
 - C a listing of variables and how they are to be controlled.
 - D the drawing of a conclusion based upon the prediction and the data collected.

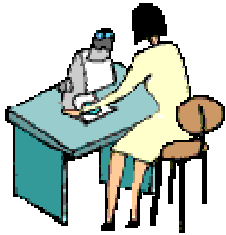
7. **Which picture below best shows engineering?**



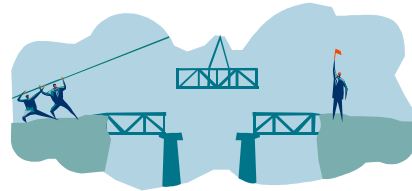
A



B



C



D

8. **STEM is an acronym (abbreviation) for**
- A Scale, Tables, Energy, and Matter
 - B Systems, Tables, Energy, and Matter
 - C Science, Technology, Energy, and Mathematics.
 - D Science, Technology, Engineering, and Mathematics

Engagement: Let's Soar

E1. In the space below, draw and label what you observed when your teacher demonstrated the Alka-Seltzer rocket.

You scientific drawing should:

- include a title.
- have as many details as possible (color, shapes, measurements).
- have all parts labeled.
- include a written explanation of what the drawing is intended to show.
- be an appropriate size for details to be easily recognized.

E2. Describe why the Alka-Seltzer rocket reacted the way it did. Use any scientific words that you know that apply.

Activity 3: Temperature and Dissolving Time

3a. Prediction:

If the temperature of the water is _____ then the dissolving time of the tablet will _____ because _____.

3b.

Dissolving Time of Tablet in Different Water Temperatures			
Cup	Description of Water Temperature	Temperature of Water (in degrees Centigrade)	Dissolving Time (in seconds)
A	Cold		
B	Room temperature		
C	Hot		

3c. What was the independent variable (variable you changed on purpose) in this investigation? What was the dependent variable (the effect that was measured or counted)?

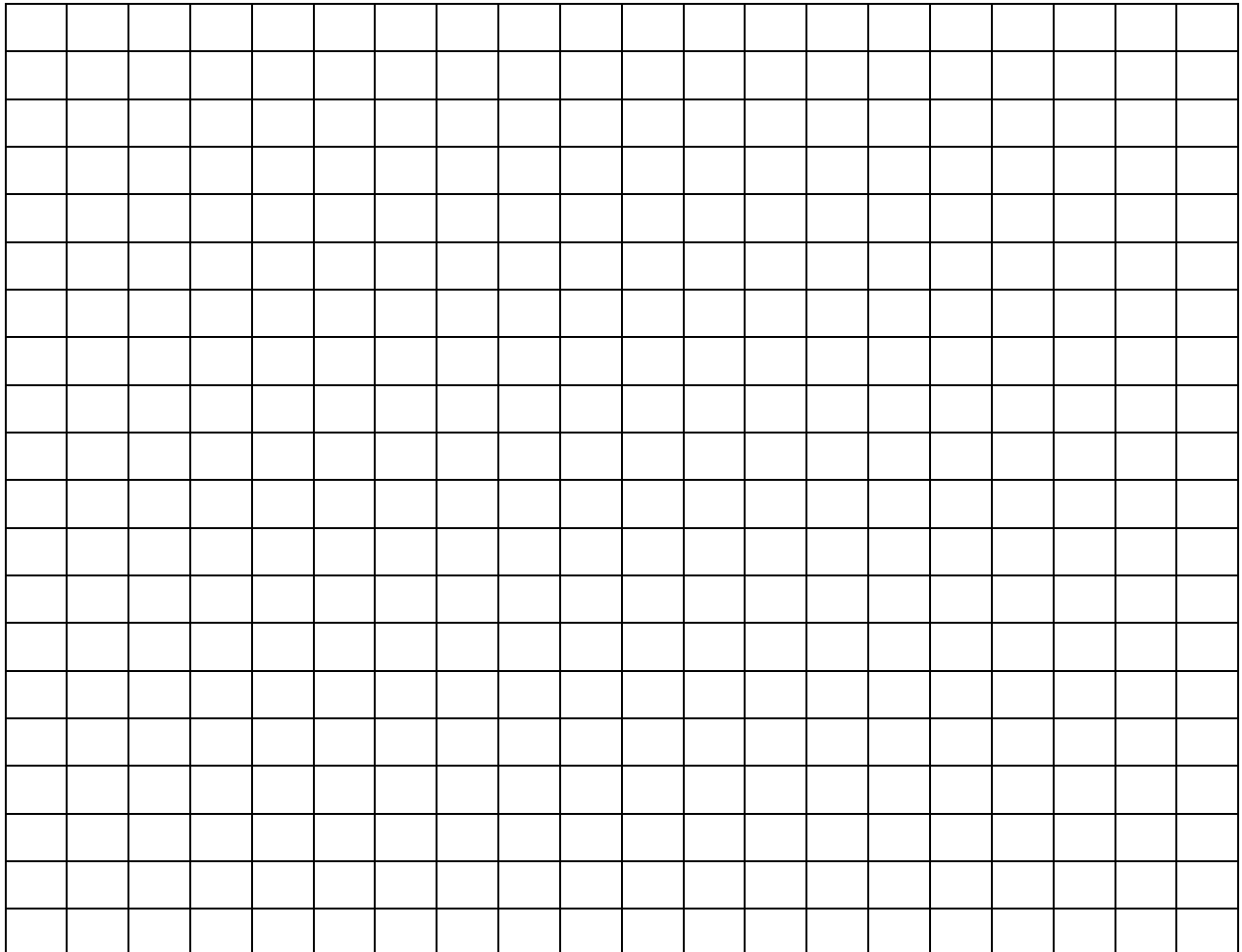
3d. Which variables were controlled (kept the same) in this investigation?

3e. Was this a well-designed investigation? Why or why not? How would you rewrite the procedures to make this a well-designed investigation? Look back at Activity 1 to see what makes an investigation “well designed” to help answer this question if necessary.

Activity 3: Temperature and Dissolving Time

3f. A bar graph is used to show counting data – in this case total dissolving time. Bar graphs show patterns in data - how data are greater than, less than, or equal to. Create a bar graph that shows how the total time it took for the tablet to dissolve changed as the temperature of the water changed. Be sure to:

- include a title that tells what is being displayed on the graph.
- number the x and y axes in even intervals (by 1's, 2's, 5's, 10's, 20's, etc.).
- label the x and y axes
- plot the data from the data table carefully



Activity 3: Temperature and Dissolving Time

3g. Calculate the mean (average) dissolving time for each temperature (cold, room temperature, hot).

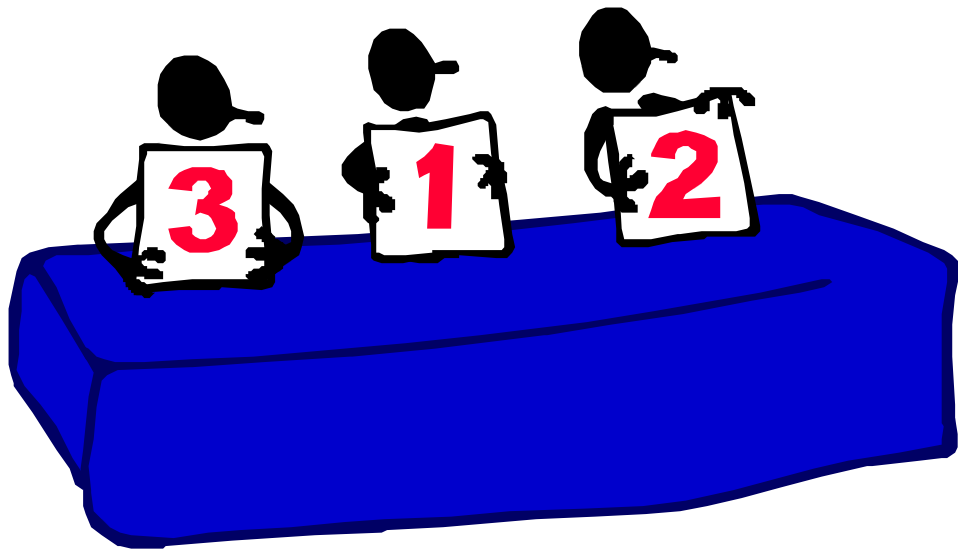
CLASS DATA FOR DISSOLVING TIMES			
GROUP NUMBER	TIME (seconds)		
	COLD	ROOM TEMPERATURE	HOT
1			
2			
3			
4			
5			
6			
7			
8			
MEAN $M = \frac{\sum \text{times}}{\text{number of groups}}$			

Now that you have calculated the class means for cold, room temperatures, and hot water, graph these data on the graph you created in 3f. Compare your group's results to the class results. How do they differ? Which data do you believe are the most accurate? Record your answers below.

Activity 3: Check Your Understanding

- 1. Based upon the investigation “Temperature and Dissolving Time” you can conclude that as the temperature increases**
 - A the Alka-Seltzer dissolves slower.
 - B the Alka-Seltzer dissolves faster.
 - C there is no effect on the dissolving time.
 - D the Alka-Seltzer does not react with the water.
- 2. Why did you use class data in “Temperature and Dissolving Time”, to compare your results? Because you can**
 - A vary the procedure.
 - B compare different variables.
 - C review your data for consistency with others.
 - D change your data if it does not fit with the class data.
- 3. In an investigation, the thing that changes is known as the**
 - A procedure.
 - B conclusion.
 - C dependent variable.
 - D independent variable.
- 4. Identifying the question, forming a prediction, and researching are steps in a**
 - A variable.
 - B data table.
 - C chemical reaction.
 - D scientific investigation.
- 5. Why are data tables used in scientific investigations? To**
 - A organize the data gathered in an investigation.
 - B record the procedures used in the investigation.
 - C graph the results and look for patterns in the data.
 - D draw conclusions and develop other questions for future investigations.

Scoring Rubrics



Alka-Seltzer Rocket Design Rubric

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Performance Criteria

1. I have successfully completed all investigations and questions within the module 3-2-1 Lift Off.
2. I have worked cooperatively with my team member(s) while completing all investigations within this module.
3. I have controlled variables in designing and launching my rocket
4. I have clearly identified both the independent and dependent variables in my final rocket design.
5. Based upon the knowledge I gained during this module, I have engineered the best rocket I can.
6. I have followed all the safety rules and guidelines for launching my rockets in my school.

Assessment			
Points	Self	Teacher	Other(s)

<input type="checkbox"/> Comments	<input type="checkbox"/> Goals	<input type="checkbox"/> Actions
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Scientific Drawing (Lantz, 2004)

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Performance Criteria

1. My scientific drawing looks similar to what I observed.
2. I included as many details as possible: colors, textures, shapes, measurements, etc.
3. I labeled all the parts of my scientific drawing.
4. I wrote a title that tells what my scientific drawing shows.
5. I provided a written explanation of what my scientific drawing is intended to show.
6. My scientific drawing is of an appropriate size for details to be easily recognized.

Assessment			
Points	Self	Teacher	Other(s)

<input type="checkbox"/> Comments	<input type="checkbox"/> Goals	<input type="checkbox"/> Actions
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Graphing Scientific Data (Lantz, 2004)

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Performance Criteria	Assessment			
	Points	Self	Teacher	Other(s)
1. I used an appropriate type of graph (bar graph, pictograph, stem-and-leaf, circle graph, line plot graph, etc.)				
2. The title of my graph clearly relates to the information displayed on the graph.				
3. I used my data to choose an appropriate interval to number my x axis and y axis (2's, 3's, 5's, 10's, 100's, etc.				
4. When placing the numbers on my graph, I spaced them evenly.				
5. I labeled all the parts of my graph (modules of measurement, x and y axis, columns, rows, etc.)				
6. My set of data is plotted on the graph accurately.				
7. My graph is clear and complete.				

<input type="checkbox"/> Comments	<input type="checkbox"/> Goals	<input type="checkbox"/> Actions
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Brief Constructed Response to Open-ended Science Questions (Lantz, 2004)

Name _____ Date _____ Course/Class _____

Task/Assignment _____

Expert 4	The responses show an in-depth understanding of the topic. Relationships among science facts and concepts are clearly, completely, and accurately explained and fully supported with relevant data, examples, or citations. Ideas are expressed clearly and succinctly in a logical manner. All aspects of the questions are addressed. Spelling and language conventions are correctly applied. Language used in the responses is appropriate for the needs of the audience.
Proficient 3	The responses show a solid understanding of the topic Relationships among science facts and concepts are explained and generally supported with relevant data, examples, or citations. Ideas are expressed, for the most part, clearly and succinctly. The various aspects of the questions are generally addressed. Spelling and language conventions are generally correct. Language used in the responses is largely appropriate for the needs of the audience. Minor errors do not interfere with meaning.
Emergent 2	The responses show a partial understanding of the topic. There is an attempt to explain the relationships among science facts and concepts, but some serious omissions or misconceptions are evident. Insufficient support is provided. Ideas are not always expressed in a clear and logical manner, making the response difficult to follow. The questions are only partially addressed. Flaws in spelling and language conventions interfere. Language used in the response is mostly inappropriate for the needs of the audience.
Novice 1	The responses show a very limited understanding of (or serious misconceptions about) the topic. Relationships among science facts and concepts are not explained. Little or no support is provided. Ideas are not presented in a clear and logical manner. The questions are not completely or satisfactorily addressed. Major flaws in spelling and language conventions make the responses difficult to follow. Language used in the responses is inappropriate for the needs of the audience.

<input type="checkbox"/> Comments	<input type="checkbox"/> Goals	<input type="checkbox"/> Actions
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