


# Short Answer Items



# Directions to Students about Answering Short Answer Items

1. For this part of the assessment, make sure you have the following items along with *Booklet 3*:
  - a pencil and an eraser or a pen
  - a scientific or a graphing calculator
  - a ruler and a protractor
2. Do all of your work (even rough work) in *Booklet 3*.
3. You will have 30 min to do these 10 items. That means you have about 3 min for each one. Give yourself time to answer all of the questions.
4. Figures in this section are not drawn to scale.
5. These questions are designed to get you to think deeply about the mathematics you know but they do not require you to write a great deal. Be sure to watch for the terms listed in the *Key Words and Phrases in Instructions* and do just what the prompt asks you to do.

For example, the question might ask you to “**Explain** your answer.” The *Key Words and Phrases in Instructions* sheet says, “**Explain** means to use words and symbols to make your solutions clear and understandable.” As soon as you can explain a mathematical reason for the answer, do so. You do not need to provide lots of calculations to illustrate your point.
6. In short answer questions, you do not have to provide lots of examples to illustrate your answer. Write a short answer.
7. You have **30 min** to work.
8. When you see the  sign, you have completed *Booklet 3*. Check your answers. Then wait quietly for directions from your teacher.

# Key Words and Phrases in Instructions

Throughout the assessment, key words and phrases are used to identify the type of response required from you. The key words and their explanations are listed below. Refer to these explanations to ensure you are responding to the question that is asked.

**Compare:**

Tell what is the same and what is different.

**Describe:**

Tell about something in a step-by-step manner.

Use words, numbers, graphs, diagrams, symbols, charts and/or pictures to do this.

**Explain:**

Use words and symbols to make your solutions clear and understandable.

**Give reasons for your answer:**

Explain your reasoning in your own words.

Give reasons and evidence to show your answer is correct or proper.

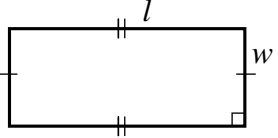
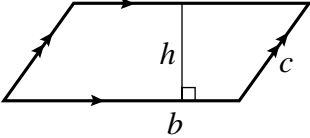
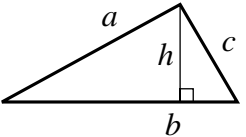
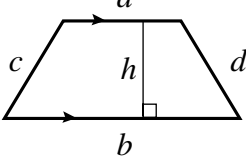
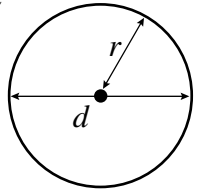
**List:**

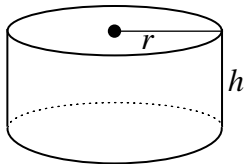
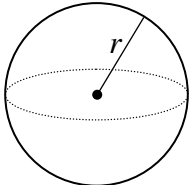
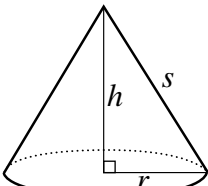
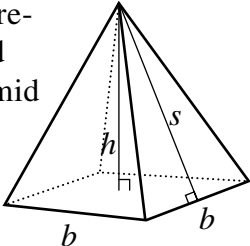
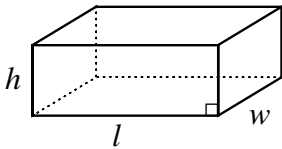
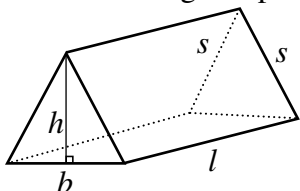
Write down or identify in point form.

**Show your work:**

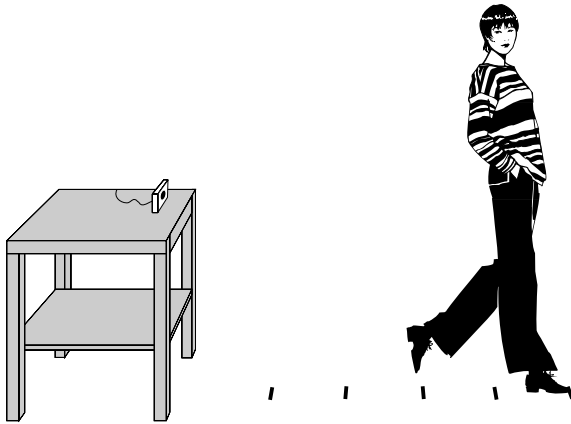
Record all calculations. Include all the steps you went through to get your answer. You may want to use words, numbers, graphs, diagrams, symbols, charts and/or pictures to explain your thinking.

# Formula Sheet

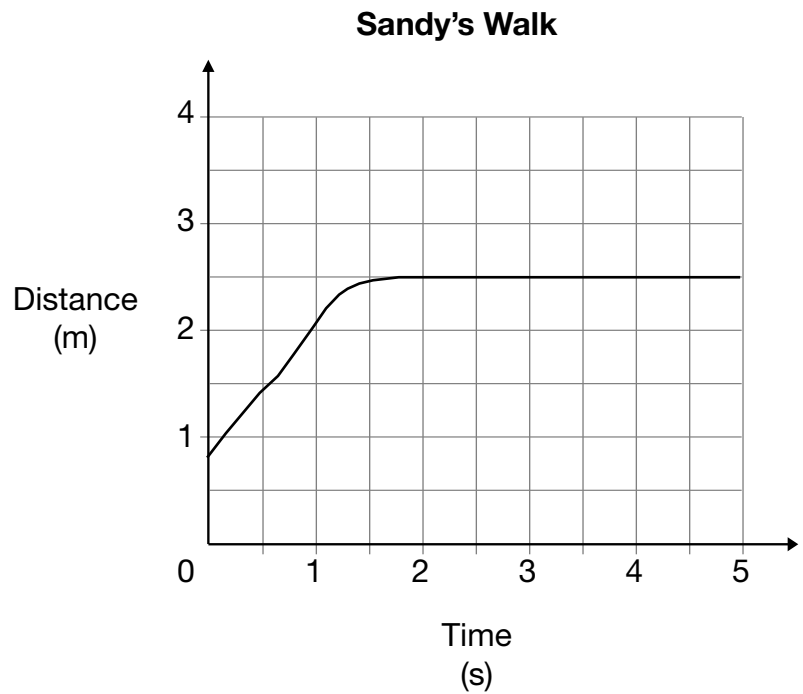
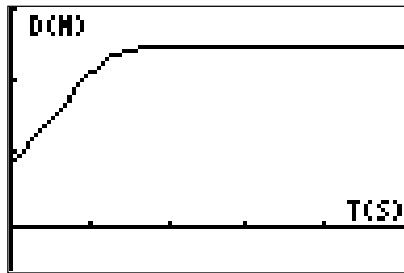
Geometric Figure	Perimeter	Area/Surface Area
<p>Rectangle</p> 	$P = 2l + 2w$ $P = 2(l + w)$	$A = lw$
<p>Parallelogram</p> 	$P = b + b + c + c$ $P = 2b + 2c$	$A = bh$
<p>Triangle</p> 	$P = a + b + c$	$A = \frac{bh}{2}$ <p><b>or</b></p> $A = \frac{1}{2}bh$
<p>Trapezoid</p> 	$P = a + b + c + d$	$A = \frac{(a + b)h}{2}$ <p><b>or</b></p> $A = \frac{1}{2}(a + b)h$
<p>Circle</p> 	$C = \pi d$ <p><b>or</b></p> $C = 2\pi r$	$A = \pi r^2$

Geometric Figure	Area/Surface Area	Volume
Cylinder 	$A_{top} = \pi r^2$ $A_{base} = \pi r^2$ $A_{side} = 2\pi r h$ $A_{total} = 2\pi r^2 + 2\pi r h$	$V = \pi r^2 h$
Sphere 	$A = 4\pi r^2$	$V = \frac{4}{3} \pi r^3$
Cone 	$A_{cone} = \pi r s$ $A_{base} = \pi r^2$ $A_{total} = A_{cone} + A_{base}$	$V = \frac{1}{3} \pi r^2 h$
Square-based pyramid 	$A_{triangle} = \frac{1}{2} b s \text{ (for each triangle)}$ $A_{base} = b^2$ $A_{total} = A_{4 \text{ triangles}} + A_{base}$	$V = \frac{1}{3} b^2 h$
Rectangular prism 	$A_{total} = wh + wh + lw + lw + lh + lh$ $A = 2(wh + lw + lh)$	$V = lwh$
Isosceles triangular prism 	$A_{triangle} = \frac{1}{2} b h \text{ (for each triangle)}$ $A_{rectangles} = ls + lb + ls$ $A_{total} = A_{rectangles} + A_{2 \text{ triangles}}$	$V = \frac{1}{2} (bh)l$

1. Sandy walked away from a motion detector.

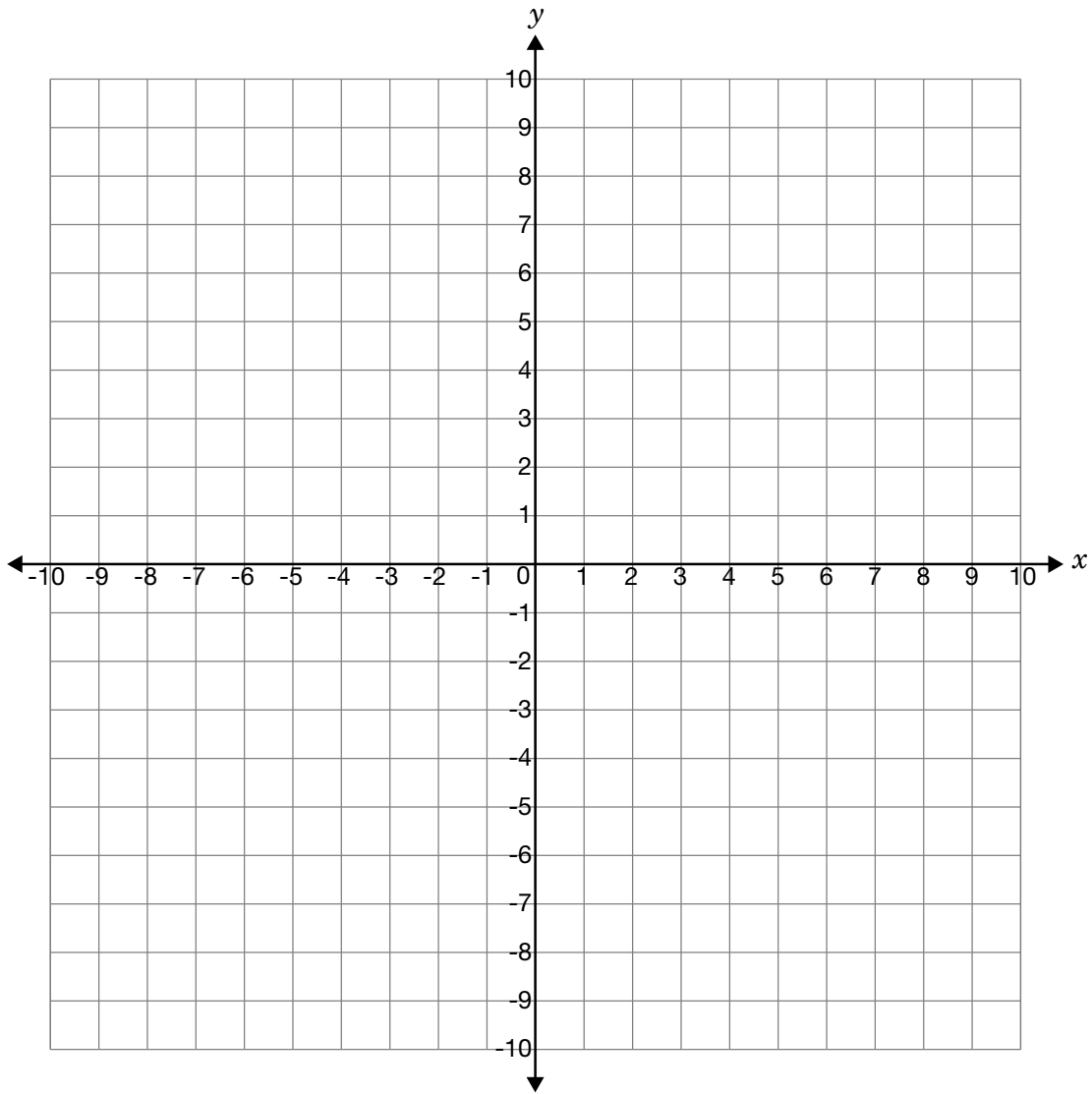


Below is a screen captured from the graphing calculator and a graph representing her walk.

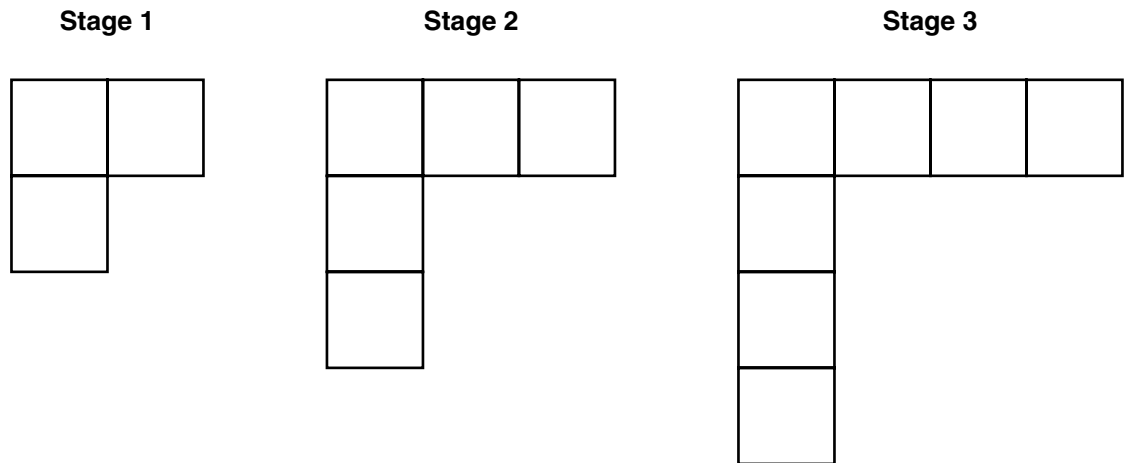


**Describe** Sandy's walk using mathematical language.  
Use any of the information presented above.

2. **Graph** the line with a  $y$ -intercept of 4 and a slope of  $\frac{1}{2}$ .



3. Louis and Marcia are investigating how many tiles they need to make a certain pattern shown below.



They gather data for the first five stages.

Stage	Number of tiles
1	3
2	5
3	7
4	9
5	11

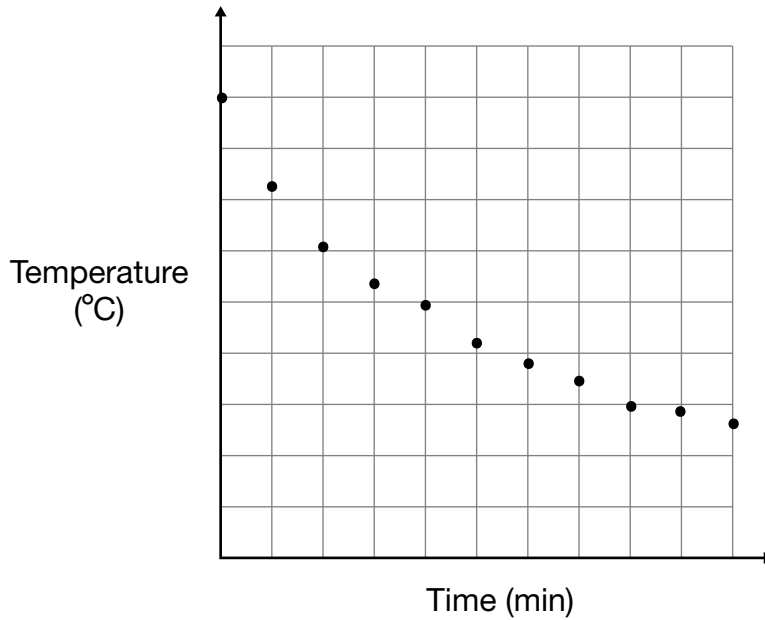
They have been asked to find the number of tiles needed for Stage 50.

- Louis wants to extend the table and use the patterns he sees to find the answer.
- Marcia wants to model the data with a formula and calculate the answer.

Evaluate their mathematical models and tell which method you would choose.

**Give reasons for your answer.**

4. A temperature probe is placed in a cup of hot water. A temperature reading is taken from the probe every minute. The results are shown on the graph below.

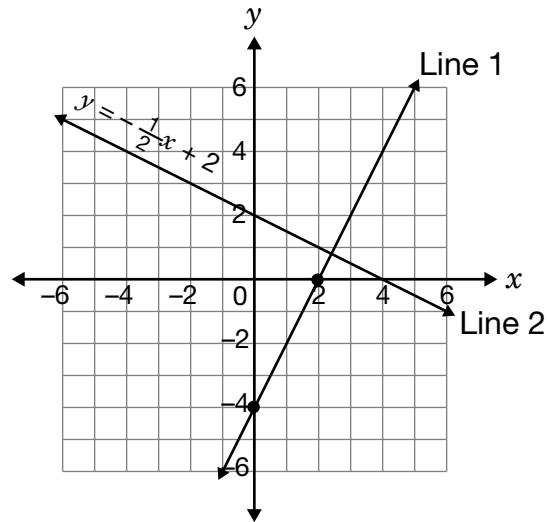


**Describe** the relationship between temperature and time (e.g., describe how the temperature of the water changes over time, predict what will happen in future readings). Suggest scales for the axes.

5. Two lines are shown on the graph below.

Line 1 passes through the points  $(0, -4)$  and  $(2, 0)$ .

Line 2 has the equation  $y = -\frac{1}{2}x + 2$ .



**Explain** what is different about the **slopes** of the two lines.



## Coding Guide

### Academic Program — Short Answer Questions

b – blank: nothing at all is written for the solution

u – unrelated or unengaged: the student has written “I don’t know” or a question mark; the student has simply rewritten the question exactly as posed; the student has offered unrelated comments or drawn pictures; the student has not engaged in the problem solution

Question Number	Codes			Category and Strand
	0	1	2	
1	<ul style="list-style-type: none"> <li>description of walk is incorrect <b>or</b></li> <li>description of walk includes one correct feature and the rest is incorrect or missing (e.g., Sandy began with a brisk walking speed and reached a comfortable speed that she could keep)</li> </ul>	<ul style="list-style-type: none"> <li>description of walk is correct and includes two of the following features:               <ul style="list-style-type: none"> <li>initial position (<math>\approx 0.8</math> m)</li> <li>final position (2.5 m)</li> <li>distance travelled (<math>\approx 1.7</math> m)</li> <li>action of stopping</li> <li>she walks away from the motion detector</li> <li>speed is constant</li> <li>speed (<math>\approx 1</math> m/s)</li> <li>travel time (<math>\approx 1.5</math> s)</li> <li>amount of time stopped (<math>\approx 3.5</math> s)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>description of walk is correct and includes three or more of the following features:               <ul style="list-style-type: none"> <li>initial position (<math>\approx 0.8</math> m)</li> <li>final position (2.5 m)</li> <li>distance travelled (<math>\approx 1.7</math> m)</li> <li>action of stopping</li> <li>she walks away from the motion detector</li> <li>speed is constant</li> <li>speed (<math>\approx 1</math> m/s)</li> <li>travel time (<math>\approx 1.5</math> s)</li> <li>amount of time stopped (<math>\approx 3.5</math> s)</li> </ul> </li> </ul>	AP R
2	<ul style="list-style-type: none"> <li>more than one error in graphing the line</li> </ul>	<ul style="list-style-type: none"> <li>one error in graphing the line (e.g., the line drawn has slope 2 or <math>-\frac{1}{2}</math> <b>or</b> the intercept of 4 has been drawn as an <math>x</math>-intercept)</li> <li>no line drawn through two or more correct points</li> </ul>	<ul style="list-style-type: none"> <li>correct graph (e.g., <math>y</math>-intercept of 4 and <math>x</math>-intercept of <math>-8</math> <b>or</b> <math>y</math>-intercept of 4 and slope of <math>\frac{1}{2}</math>) <b>Note:</b> arrows at the ends of the line are not necessary</li> </ul>	KU G
3	<ul style="list-style-type: none"> <li>provides no evidence of logical reasoning <b>or</b> selects an approach to the question with no reasons given</li> </ul>	<ul style="list-style-type: none"> <li>provides evidence of reasoning that is somewhat logical or incomplete with or without an appropriate conclusion (e.g., makes reference to only one method: “I would pick Louis’s method because I know I can do that” <b>or</b> “I would pick Marcia’s because it is quicker.”)</li> </ul>	<ul style="list-style-type: none"> <li>provides evidence of logical reasoning that makes reference to <b>both</b> methods, with appropriate conclusion based on reasoning (e.g., “I would pick Marcia’s because I could find a formula easily and that would be faster than writing out 50 rows of the table.”)</li> </ul>	PS N
4	<ul style="list-style-type: none"> <li>incorrect description (e.g., temperature increases)</li> </ul>	<ul style="list-style-type: none"> <li>incomplete description of relationship between temperature and time (e.g., temperature decreases; water gets colder; as time increases, temperature decreases)</li> </ul>	<ul style="list-style-type: none"> <li>complete, general description of relationship between temperature and time (e.g., temperature decreases with time and then levels off) <b>Note:</b> scales may or may not be mentioned</li> </ul>	PS R
5	<ul style="list-style-type: none"> <li>inappropriate properties listed (i.e., not slope properties)</li> </ul>	<ul style="list-style-type: none"> <li>a partially accurate comment on one of the following: signs, direction, or steepness (e.g., same slope but L1 is positive and L2 is negative, <b>or</b> L1 is negative and L2 is positive) <b>or</b></li> <li>no direct reference to each line (e.g., one line is positive and the other is negative)</li> </ul>	<ul style="list-style-type: none"> <li>accurately comments on one of the following: signs, direction or steepness with direct reference to each line (e.g., line 1 is steeper than line 2)</li> </ul>	AP G