Patricia's Patterns

1

Patricia has been exploring number patterns consisting of 4 consecutive integers. She has noticed a relationship between the products of the inside numbers and the outside numbers. Complete Patricia's table and then explain what you think Patricia's discovery is. Will this always be true? Justify your answer algebraically.

Number	Inside product	Outside product
3, 4, 5, 6		
6, 7, 8, 9		
10, 11, 12, 13		
15, 16, 17, 18		
40, 41, 42, 43		

Stacking Rods I

2

Cuisenaire rods are wooden materials often used for mathematics activities in primary classrooms. They were invented by Georges Cuisenaire in 1952. They consist of 10 rectangular rods with height = 1 cm, width = 1 cm and lengths of 1–10 cm. Most Cuisenaire rods follow the system below:

white rod = 1 cm

red rod = 2 cm

light green rod = 3 cm

purple rod = 4 cm

yellow rod = 5 cm

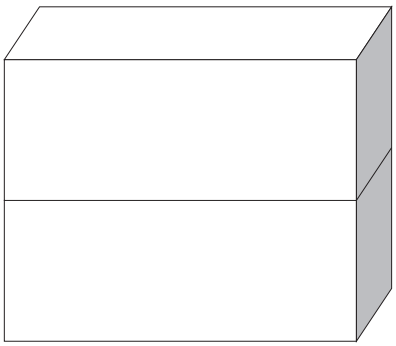
dark green rod = 6 cm

black rod = 7 cm

brown rod = 8 cm

blue rod = 9 cm

orange rod = 10 cm



Peter is making stacks of purple rods and recording the surface area of the exposed sides in a table. What is the surface area of a stack of n purple rods? (Assume that the sides of the rods are exposed, but not the bottom surface.)

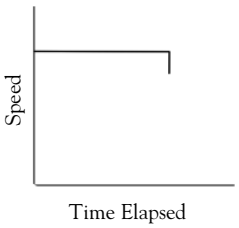
Interpreting Graphs I

33

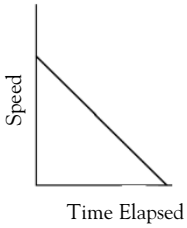
Which graph best represents the given situation? Be prepared to justify your answers.

1. A commuter train pulls into a station and drops off all its passengers.

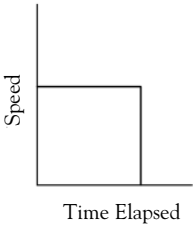
a.



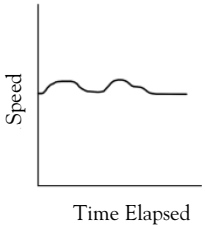
b.



c.

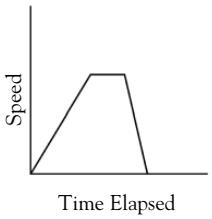


d.

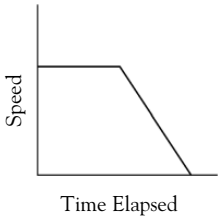


2. A child walks to a slide, climbs up to the top and then slides down.

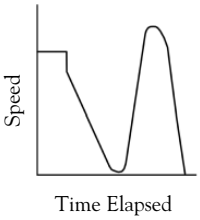
a.



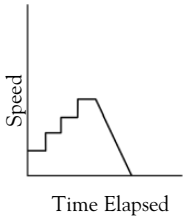
b.



c.



d.



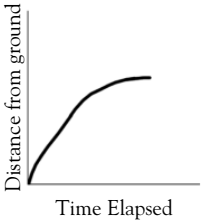
Interpreting Graphs II

34

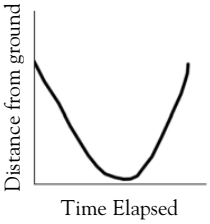
Which graph best represents the given situation? Be prepared to justify your answers.

1. A little boy swings on a swing at a playground.

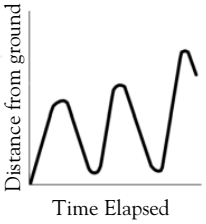
a.



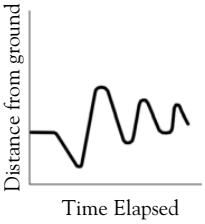
b.



c.

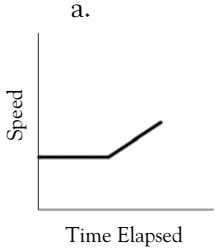


d.

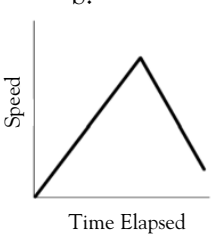


2. A woman walks up a hill at a constant rate and then runs down the other side.

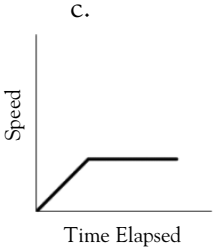
a.



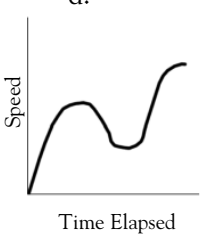
b.



c.



d.



Ping-Pong Prices

49

Lily found the price of ping-pong balls listed on the Internet at $4.75 for a package of 6 balls. Shipping and handling was listed at $1.00 per package.

1. Write an equation that represents the total cost for different numbers of packages of ping-pong balls.

2. Sketch a graph of this relationship.

3. If you shift your graph up a value of $.50, does this mean the price per package increased, or the shipping price increased?

4. Write a new equation for the situation in question 3.

Graphing People Over Time

50

Think about each situation below. Then sketch a graph to represent the situation over a 24-hour period of time. Label each graph carefully using the horizontal axis to represent the time of day. Be prepared to explain and justify your choices.

1. the number of people at a very popular pizza restaurant on a Saturday

2. the number of people in a school building on a weekday in September

3. the number of people at a sports stadium on the day of a big game

4. the number of people at a movie theatre on a weekend day

67

Solving Equations I

Tucker is tutoring his cousin James in pre-algebra. He is trying to explain different strategies for solving an equation such as $53 = 17 - 4x$. What steps or approaches should he recommend to James? Explain your ideas carefully.

68

Solving Equations II

Solve each equation below symbolically. Be prepared to justify your answers.

1. $3x + 7 = 19$
2. $7 + 4x = 31$
3. $26 - 3x = 4x + 19$
4. $x^2 - 3.5x = 0$
5. $13x - x^2 = 0$
6. $x^2 - 10x = 5x^2 - 2x$
7. $4x(x - 5) = 0$
8. $3.5(x + 2) + 2(x + 2) = 0$
9. $5.5x = x - 9$
10. $49x - 7x^2 = 0$

Manipulating Matrices

89

Perform the indicated operations on the given matrices and scalars without using a calculator.

$s_1 = 4,\ s_2 = -3$ $\quad [A] = \begin{bmatrix} 3 & 6 \\ 4 & 2 \end{bmatrix}$ $\quad [B] = \begin{bmatrix} -2 & 4 \\ 5 & -1 \end{bmatrix}$ $\quad [C] = [-2 \quad 4 \quad 3]$

$[D] = [3 \quad -2]$ $\quad [E] = \begin{bmatrix} -1 & -5 \\ 3 & -4 \\ 2 & 3 \end{bmatrix}$ $\quad [F] = \begin{bmatrix} 3 & -2 & 4 \\ -1 & 5 & -3 \end{bmatrix}$

1. $[A] + [B]$
2. $s_1 \bullet [B]$
3. $[F] \bullet [B]$
4. $[B] \bullet [B]$
5. $[F] \bullet [E]$

More Manipulating Matrices

90

Perform the indicated operations on the given matrices and scalars without using a calculator.

$s_1 = 4,\ s_2 = -3$ $\quad [A] = \begin{bmatrix} 3 & 6 \\ 4 & 2 \end{bmatrix}$ $\quad [B] = \begin{bmatrix} -2 & 4 \\ 5 & -1 \end{bmatrix}$ $\quad [C] = [-2 \quad 4 \quad 3]$

$[D] = [3 \quad -2]$ $\quad [E] = \begin{bmatrix} -1 & -5 \\ 3 & -4 \\ 2 & 3 \end{bmatrix}$ $\quad [F] = \begin{bmatrix} 3 & -2 & 4 \\ -1 & 5 & -3 \end{bmatrix}$

1. $s_1 \bullet [A] - s_2[B]$
2. $[D] \bullet [B]$
3. $[B] \bullet [C]$
4. $[E] \bullet [F]$