

Interactive I.T. Student Activity Sheets Junior Certificate Strand 4



- Student Activities written to match the I.T. interactive modules on the Project Maths Junior Certificate Student's CD Strand 4
- Interactive Activity Sheets included to enhance students' understanding of mathematical concepts
- Simple and clear guidelines are provided to facilitate learning
- Interesting questions are provided to lead students to explore, construct and consolidate their learning

Preface

The NCCA have pointed out particular Key Skills in their Draft Syllabus. “While particular emphasis is placed in mathematics on the development and use of information processing, logical thinking and problem-solving skills, the new approach being adopted in the teaching and learning of mathematics will also give prominence to students being able to develop their skills in communicating and working with others. By adopting a variety of approaches and strategies for solving problems in mathematics, students will develop their self-confidence and personal effectiveness.” To help our students to adapt to and take advantage of this new spirit of the syllabus, we have produced Interactive I.T. Student Activity Sheets which incorporate an innovative and diversified learning environment for mathematics.

As we all know, the advancement in technology has changed the way we can learn mathematics. Therefore we have developed a number of interactive modules on our student’s CD to match this new development. With the help of these interactive modules, students can not only enhance their understanding in mathematics, but they can also enjoy learning it.

In order to help our students use the I.T. tools more effectively, ***Interactive I.T. Student Activity Sheets Junior Certificate Strand 4*** are produced in this booklet. A student activity sheet is designed for the majority of the interactive modules on the CD. All student activity sheets provide simple and clear guidelines including:

1. Reference to the related topics in ***Project Maths Student’s Junior Certificate Strand 4 section***
2. Purpose of the I.T. tools
3. Instructions for using the I.T. tools.

These Student Activity Sheets, which include many interesting questions, will lead students to explore, construct, and consolidate their knowledge of mathematics on their own with ease. We believe that with the help of these activities, students’ knowledge and understanding of mathematics will grow.

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Instructions for use

This booklet contains student activities to accompany the majority of the interactive files on the Junior Certificate Strand 4 section of the student disk. The specific section of the course that the activity relates to is specified in the name of the activity. At the top of each student activity the students are told what interactive file on the student disk is to accompany the student activity.

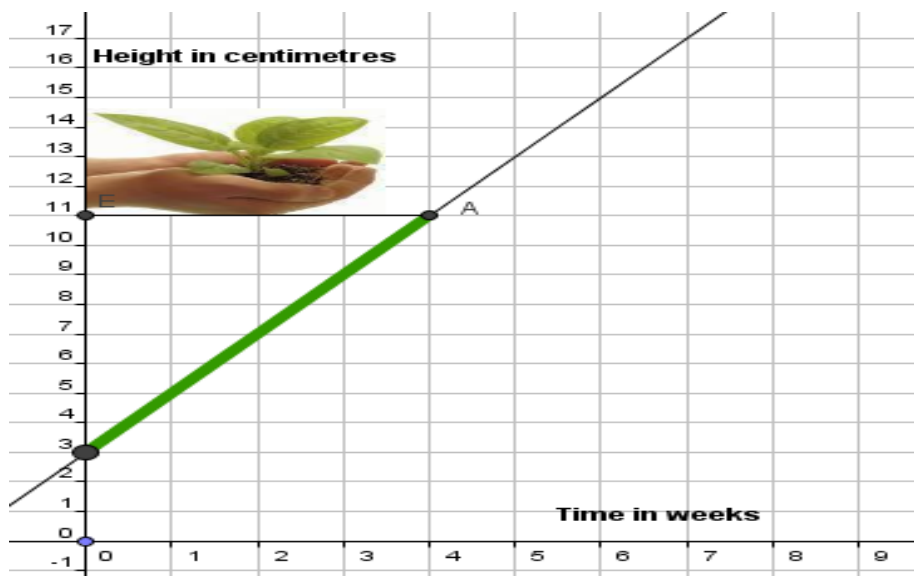
Technical Problems

The student disk has a link situated on the left hand side of its front page called “Troubleshooting” this section gives instructions, if any of the following problems are encountered:

- Problems opening Office 2007 documents
- You do not have Java on your machine
- You do not have a PDF reader on your machine.

Student Activity: To investigate a graph that represents the growth pattern of a plant, given the starting height and the growth per week

Use in connection with the interactive file, 'Growth of a Plant Graph ', on the Student's CD.



1.

The diagram above shows the height of a plant, recorded over 4 weeks.

a. What height was this plant when it was bought?

b. Using the diagram above complete the following table:

Time in weeks	0	1	2	3	4
Height in centimetres					

c. Do you notice a pattern in the data?

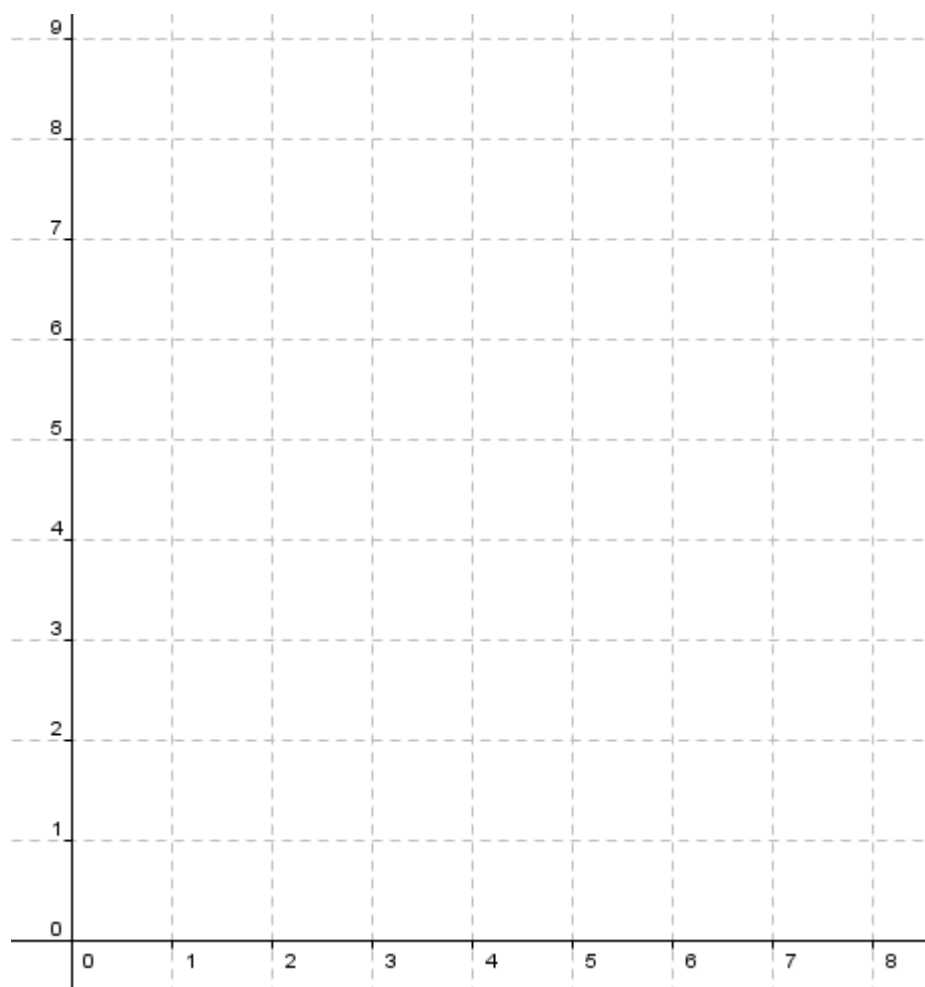
d. Assuming the plant continues the same pattern of growth, what would be the height of this plant after 10 weeks?

e. Find the co-ordinates of any 2 points on the line representing the growth pattern of the plant in the diagram above. Using these points find the slope of the line that represents the growth pattern.

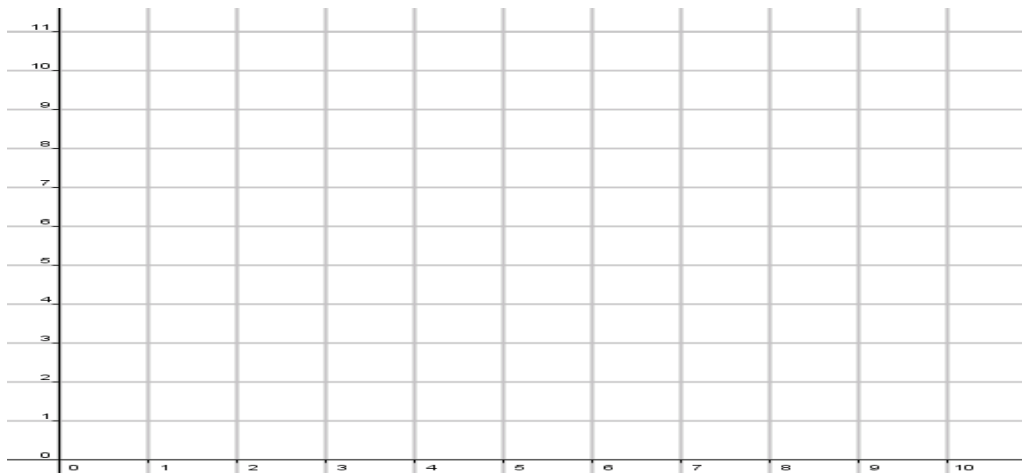
- f. What do you notice about the slope and the rate of growth of the plant?

- g. Describe in 2-3 sentences the growth pattern of the plant using some or all of the answers from the above questions.

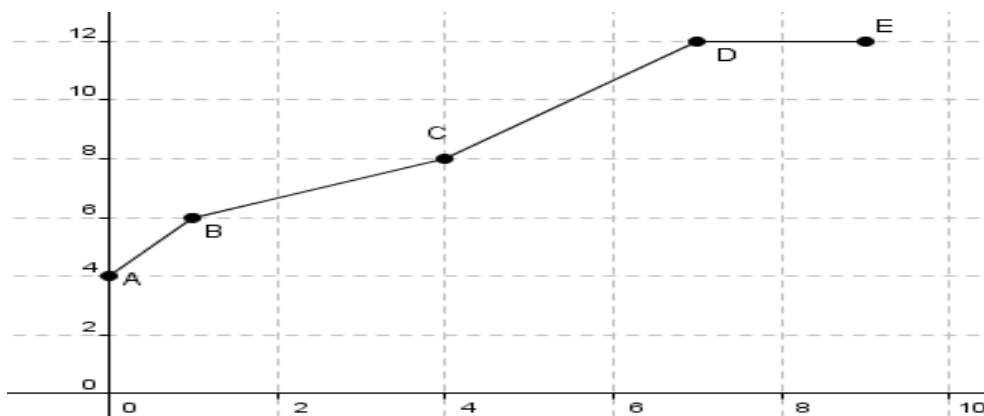
- h. If the plant had been 1cm when it was bought and had the same rate of growth as above draw the line which would represent this situation on the graph below.



2. Draw a graph to represent a plant that was 4 cm when it was bought and grows 1 cm per week after that.



3.



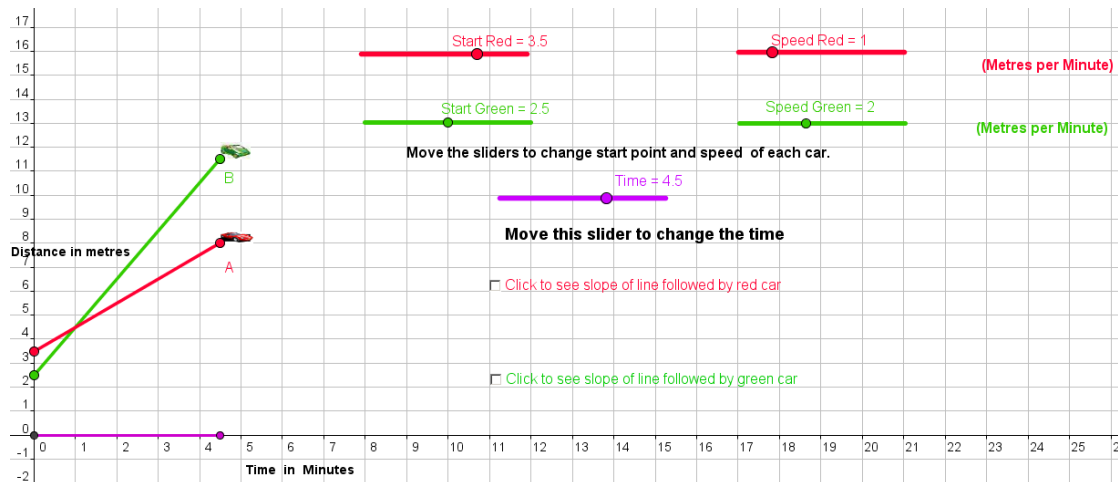
- Does the plant whose growth is represented by the above diagram have a regular pattern of growth? (Assume time in days is represented on the x axis and height in centimetres on the y axis.) _____
 - Calculate the rate of growth between each of the consecutive points.

4. In order for the growth pattern of a plant to be represented by a complete straight line, what type of growth pattern must the plant have throughout its life?

5. What determines the shape of the graph that represents the growth pattern of a plant? _____

Student Activity: To investigate the effect on the graph when the toy cars have different starting times and different speeds

Use in connection with the interactive file, '2 Cars', on the Student's CD.



1.

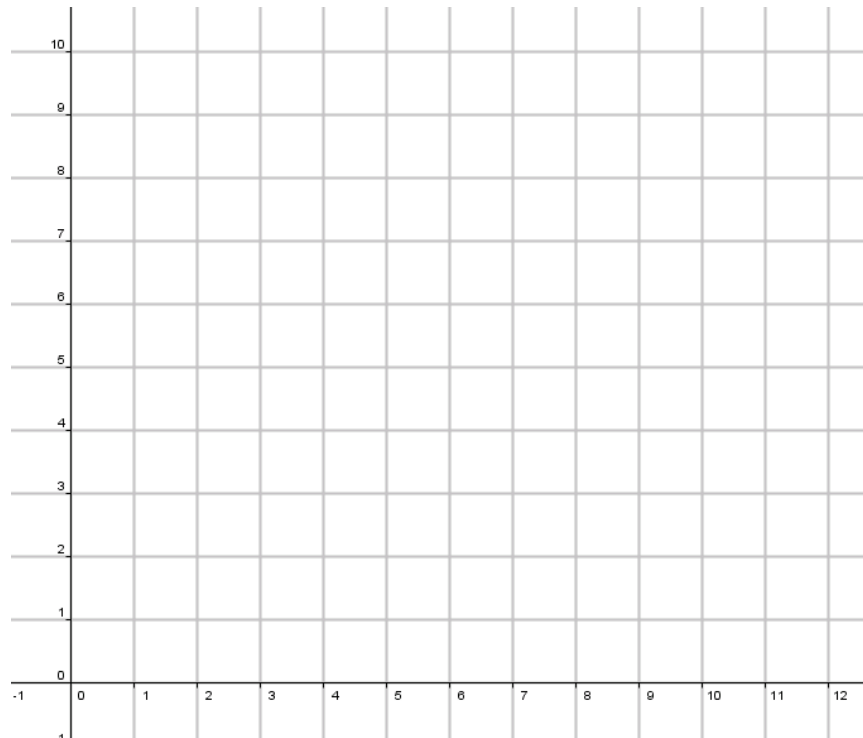
- a. Complete the following table for a toy car, if the car starts at 1 metre beyond the starting point and its speed is 2 metres per minute.

Time in Minutes	Distance in Metres from starting point
0	
1	
2	
3	
4	
5	

- b. In your own words, describe the pattern formed from the numbers in the table above?

- c. How does this pattern relate to the information received in part a of this question?

d. Draw a graph to represent the table above:



2. The red line in the graph below represents the route taken by a toy red car.

a. Complete the following table for the red car in the diagram below:

Time in Minutes	0	1	2	3	4
Distance in metres					

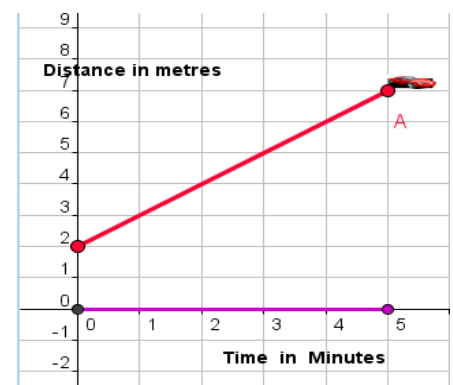
b. What is the starting point of the red car?

c. What distance is the red car from its starting point when it reaches point A?

d. What is the time in minutes the red car has taken to reach point A?

e. What is the speed of the red car?

f. What is the change in the distance of this red car from its starting point, between time equals 1 and time equals 2?



- g. What is the change in the distance of this red car from its starting point, between time equals 2 and time equals 3?

- h. From the graph, what is the change in the distance for each unit change in time?

- i. How does the change in distance per minute relate to the speed of the car?

- j. If the slope of a line equals $\frac{\text{Change in } y}{\text{Change in } x}$, which in this case is $\frac{\text{Distance}}{\text{Time}}$, calculate the slope of the line followed by the red car using 3 different pairs of points.

- k. What can you conclude about the relationship between the speed of the car and the slope of the line, represented by the route taken by the car?

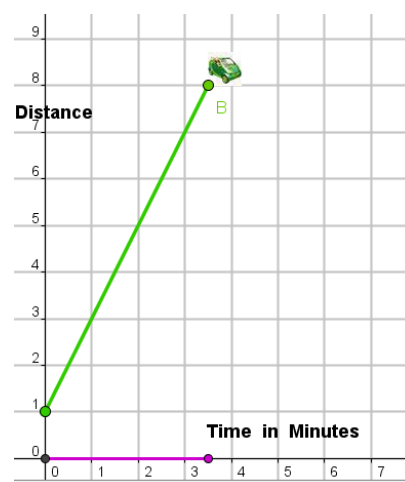
3. The green line represents the route taken by a toy green car, what is:

- a. The starting point of the green car?

- b. The distance travelled by the car from its starting point until it reaches point B?

- c. The time in minutes the green car has taken to reach point B?

- d. The speed of the green car?



- e. What is the change in the distance of this green car from its starting point, between time equals 1 and time equals 2?
-

- f. What is the change in the distance of this green car from its starting point, between time equals 2 and when time equals 3?
-

- g. From the graph, what is the change in the distance for each unit change in time?
-

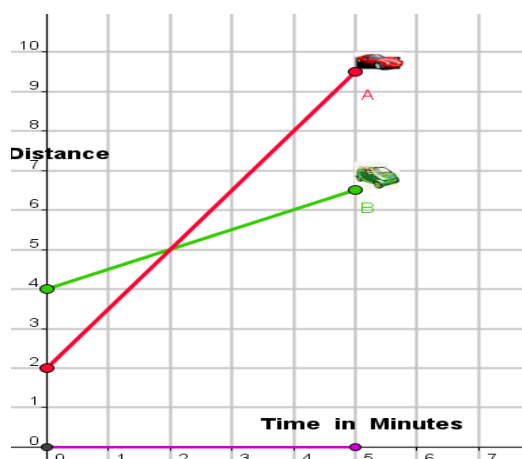
- h. How does the change in distance per unit relate to the speed of the car?
-

- i. If the slope of a line equals $\frac{\text{Change in } y}{\text{Change in } x}$, which in this case is $\frac{\text{Distance}}{\text{Time}}$, calculate the slope of the line followed by the green car using 3 different pairs of points.
-
-
-

- j. What can you conclude about the relationship between the speed of the car and the slope of the line that is represented by the route taken by the car?
-
-

4.

- a. What was the starting point of each of the cars?
-
- b. For how long has each car had been travelling?
-
- c. After how much time did the 2 cars meet?
-



- d. What was the speed of each car?

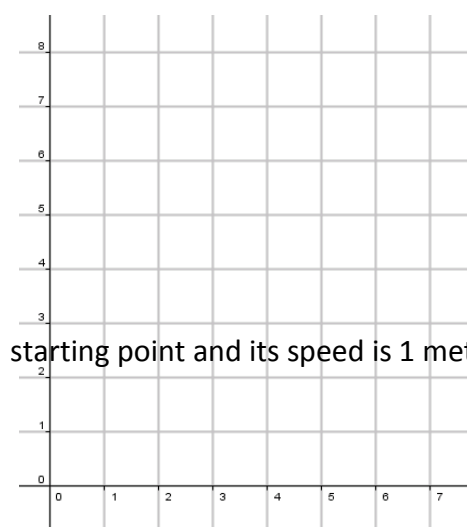
- e. What is the slope of the line followed by the red car?

- f. What is the slope of the line followed by the green car?

- g. Which line has the greatest slope and what does that tell you about the speed of that car?

5.

- a. Draw a graph to represent the following situations. A red car starts 1 metre from the starting point and its speed is 2 metres per minute. A green car starts 2 metres from the starting point and its speed is 1 metre per minute.



- b. When do these 2 cars meet?

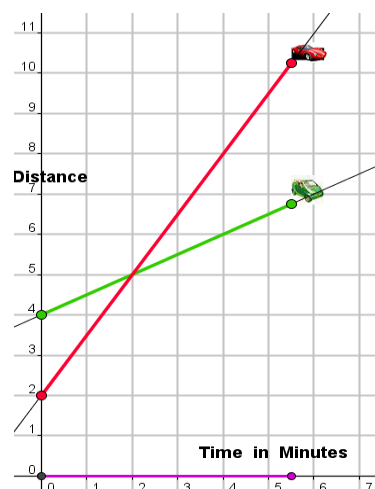
Challenges

6.

- a. In the opposite diagram, what determines the slope of the red line?

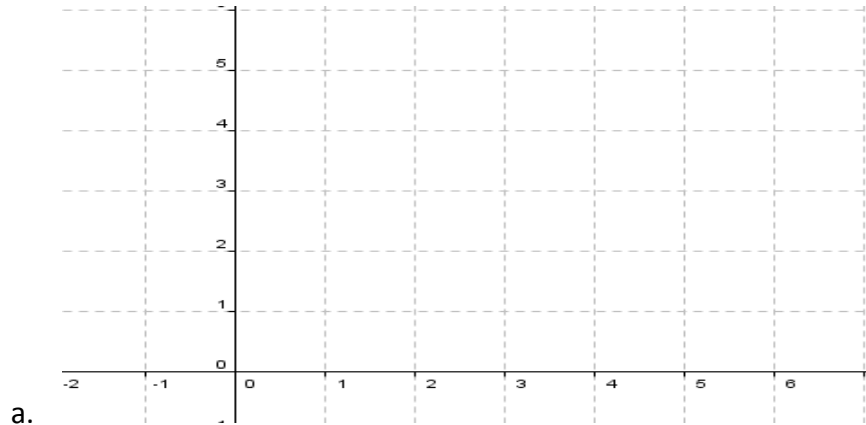
- b. What happens to the slope of the path followed by a car if the speed increases?

- c. Find the slope of the line travelled by the red car in the opposite diagram.

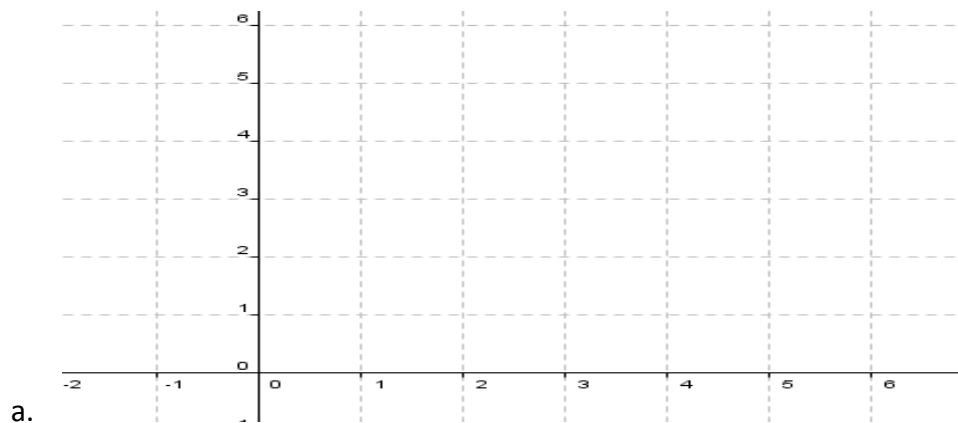


- d. Find the slope of the line travelled by the green car in the above diagram.

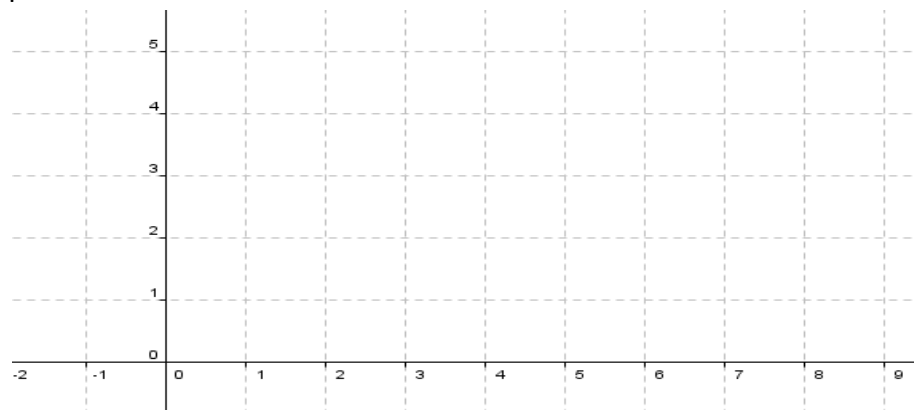
7. If toy car A has a higher starting point than toy car B and goes faster than toy car B, will they ever meet? Draw a diagram.



8. If toy car A has a higher starting point than toy car B and goes slower than toy car B, will they ever meet? Draw a diagram.

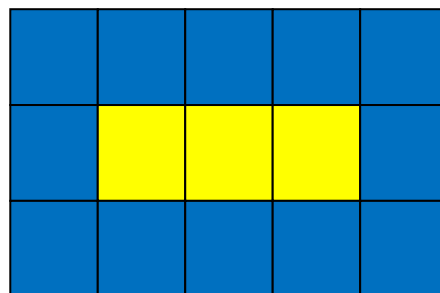
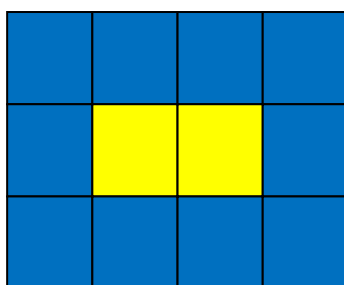
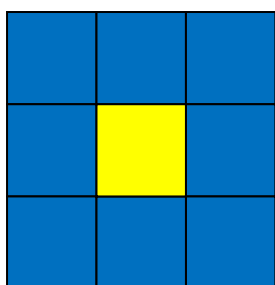


9. Draw a diagram to represent a toy car that starts at 4 metres from the starting point and has a speed of zero.



Student Activity: Tile Patterns

Use in connection with the interactive file, 'Tiles', on the Student's CD.



- Each time a new figure is made in the diagram above how many blue tiles and how many yellow tiles are added?

- Complete the following table:

Number of Yellow Tiles	Number of Blue Tiles	Number of blue tiles added	Number of yellow tiles added
1	8		
2	10	2	1
3			
4			
5			
6			
7			
8			
9			
10			

- For each yellow tile added how many blue tiles are added?

- Describe the pattern formed with the yellow and blue tiles in your own words.

- Let the number of yellow tiles = n , we know from our first shape that the yellow tile is surrounded by 8 blue tiles, and each time we add a yellow tile we must add two blue tiles.

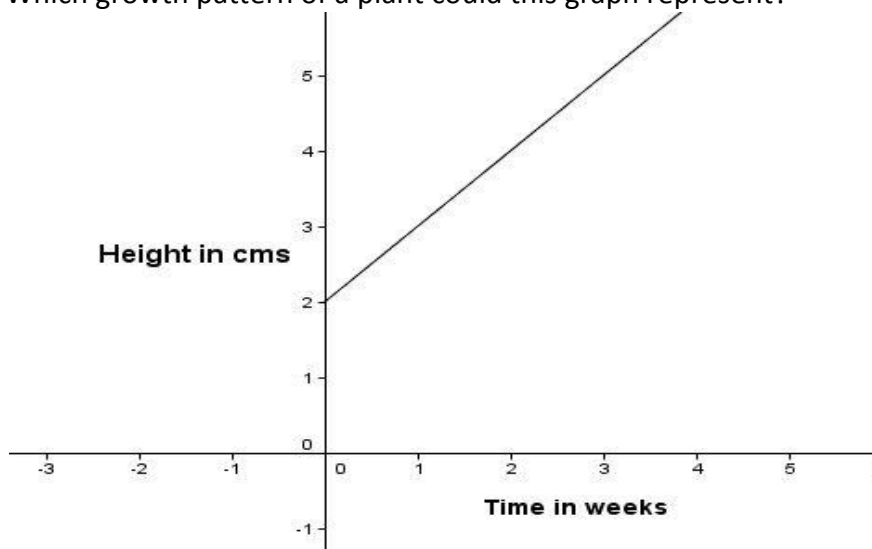
- Can you write a formula that represents the total number of tiles used in any of the shapes?

- What is the formula in terms on the number of yellow tiles that represents the total number of blue tiles?

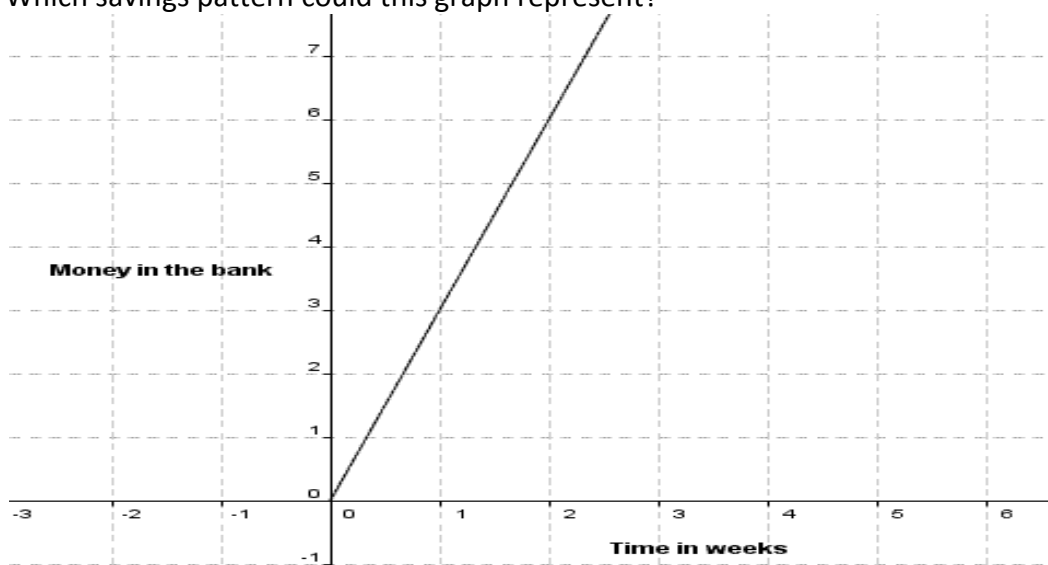
- If 100 yellow tiles are used, how many blue tiles must be used to complete the pattern? Explain how you got your answer.

Patterns Quiz 1

1. Which growth pattern of a plant could this graph represent?

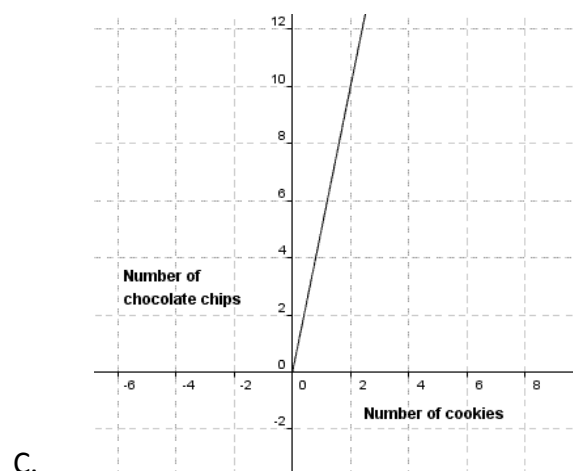
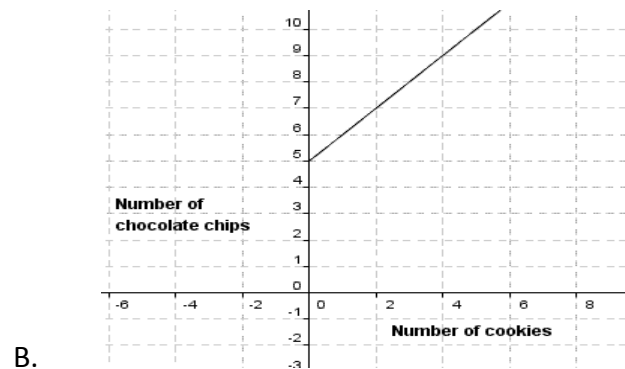
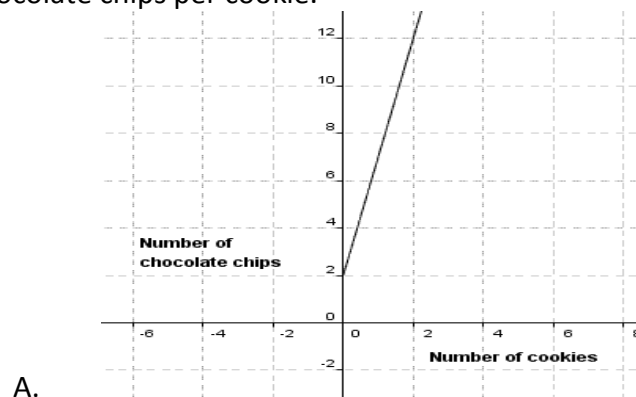


- A. Starting height 1 cm and a growth rate of 2 cm per week.
 - B. Starting height 2 cm and a growth rate of 1 cm per week.
 - C. Starting height 1 cm and a growth rate of 1 cm per week.
 - D. Starting height 2 cm and a growth rate of 2 cm per week.
2. Which savings pattern could this graph represent?

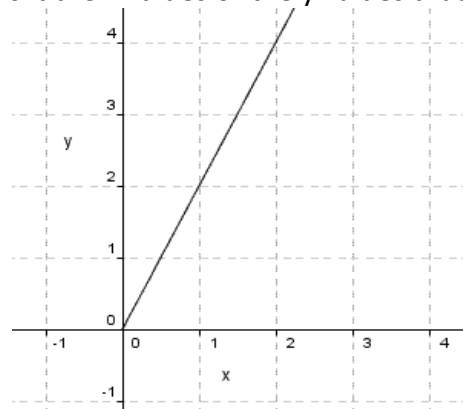


- A. Starts with €4 and saves €3 per week.
- B. Starts with €0 and saves €2 per week.
- C. Starts with €0 and saves €3 per week.
- D. Starts with €0 and saves €6.

3. Which graph represents the following situation? Mary is making cookies and uses 5 chocolate chips per cookie.



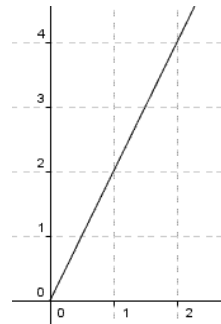
4. Given that the x axis represents time and the y axis represents the amount of money saved, is it the x values or the y values that are the independent variables in this



graph?

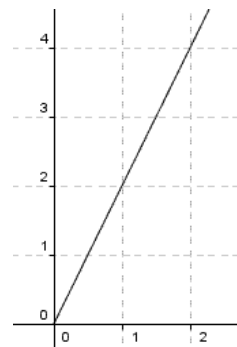
- A. Both
B. x
C. y
5. What is the rate of change of this graph?

- A. 2
B. 0
C. 1
D. 4



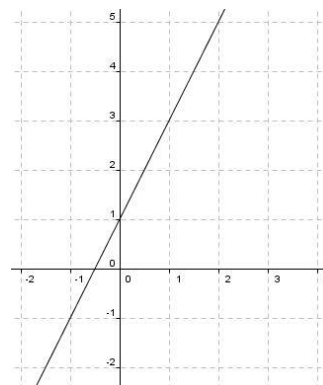
6. What is the slope of this graph?

- A. 1
B. 0
C. 4
D. 2

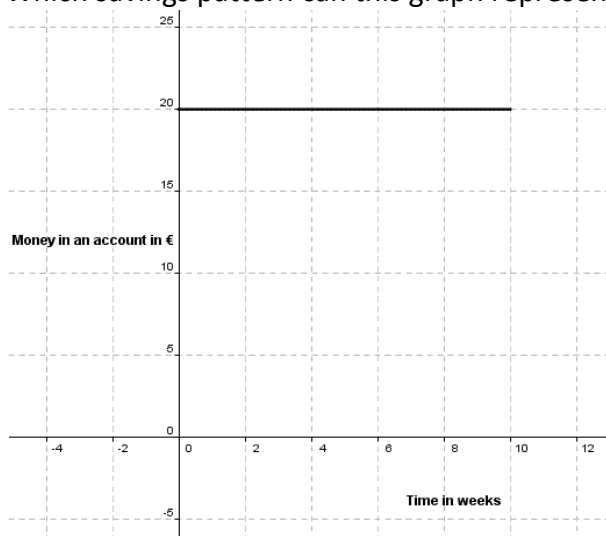


7. What formula represents this graph?

- A. $y=1+x$
B. $y=2x$
C. $y=1+2x$
D. $y=x$

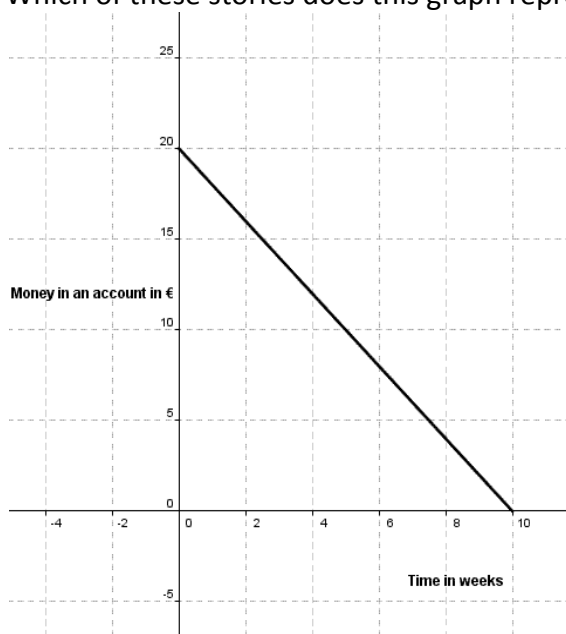


8. Which savings pattern can this graph represent?

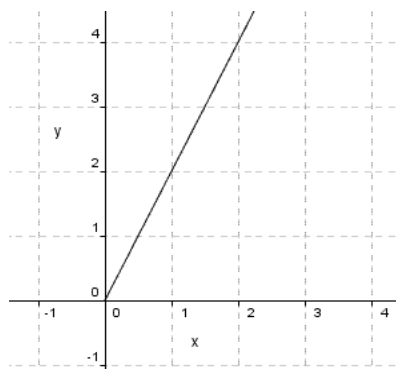


- A. Billy withdraws 20 per week from his account.
- B. Billy saves €20 per week.
- C. Billy gains €20 interest per week.
- D. Billy has €20 in his account and never increases or decreases this amount and gains no interest.

9. Which of these stories does this graph represent?



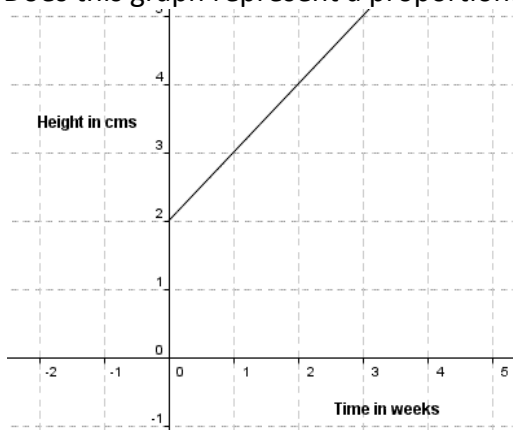
- A. The saver withdraws €20 per week from their account.
- B. The saver saves €2 per week.
- C. The saver had €20 in the beginning and withdraw €2 per week after that until it was finished.
- D. The saver had €20 in the beginning and saved €2 per week after that.



10. Which type of graph does this diagram represent?

- A. Quadratic
- B. Cubic
- C. Exponential
- D. Linear

11. Does this graph represent a proportional situation?



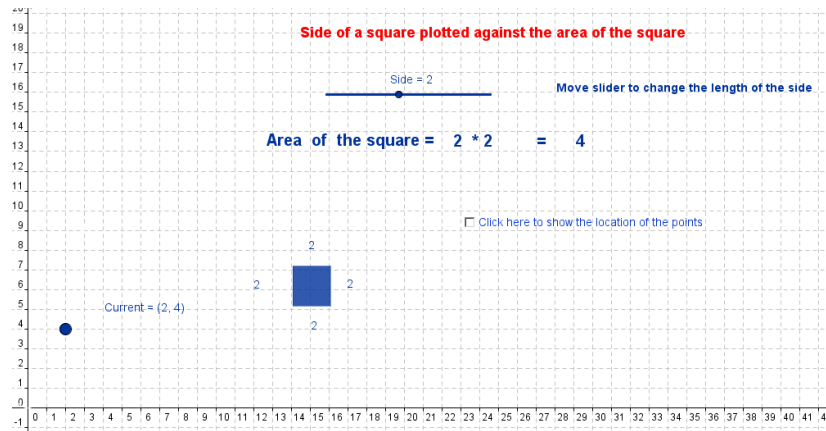
- A. No
- B. Yes

12. Which of the following situations would be represented by a proportional linear function?

- A. The price a repair man charges if he has an initial call out charge plus a rate per hour for the time he is on the job.
- B. Someone has €20 in their account and adds €5 per week after that.
- C. The cost of calls using a mobile phone network if the network charges 10 cents per call for the first 20 and 15 cents per call after that.
- D. The number of sandwiches required for a set of lunchboxes provided each lunchbox has the same number of sandwiches.

Student Activity: To investigate the relationship between the length of the side of a square and the area of this square

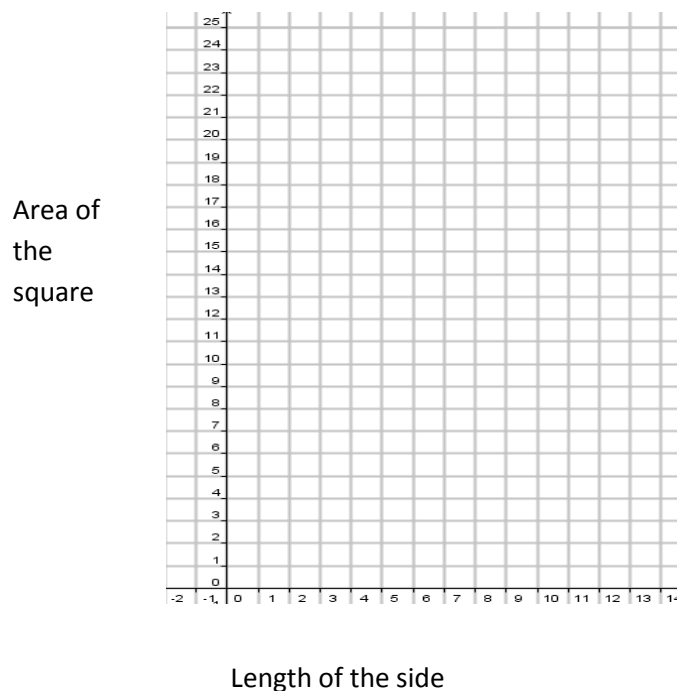
Use in connection with the interactive file, 'area of a square', on the Student's CD.



1. Complete the following table:

Length one side of a square	Area of the square
1	
2	
3	
4	
5	

2. Mark the points obtained in the table in 1 on the graph paper.



3. If the side of the square is 0, what will be the area of the square? Explain your answer.

Add this point to your graph in question 2.

4. Now join the points on your graph. How would you describe the shape of the graph? (Notice that you have only plus values for x).

Check it with the interactive file. (Move the slider slowly and read the values of x and y as you go).

5. Can you predict using your graph what the area would be if the length of the side was 3.1? Explain how you made your prediction.
-

6. Did your answer in question 5 agree with the interactive file?
-

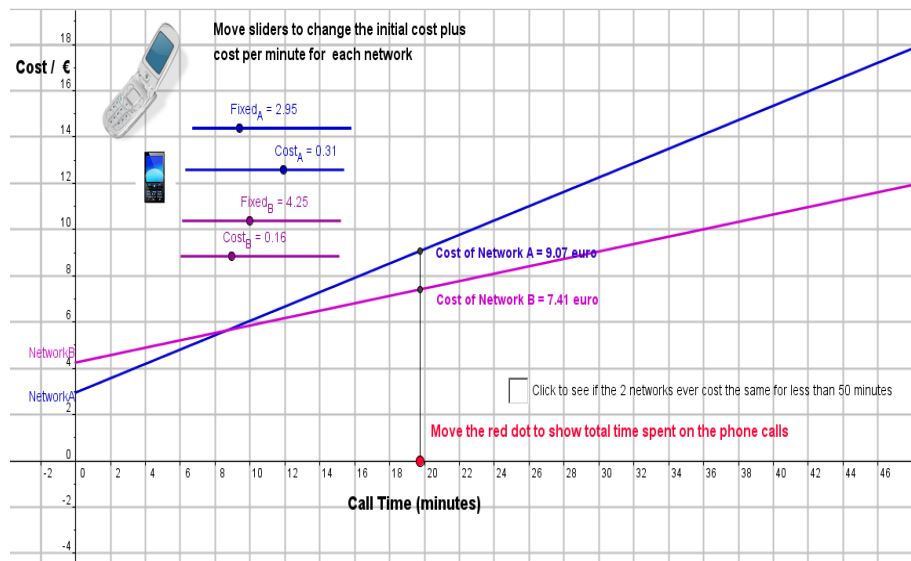
7. Using the interactive file determine what the side length of the square will be if the area of the square is 10.24.
-

8. Is the rate of change of the area a constant? How can you tell from the table? How can you tell from the graph?
-

9. What is the relationship between the length of the side (x) and the area (y)? Write this relationship as a mathematical equation.
-

Student Activity: To investigate two mobile phone network charges

Use in connection with the interactive file, 'Phone Networks', on the Student's CD.



- Eithan wishes to get a connection to a bill pay phone company and has two networks to choose from.

Network A has a fixed charge of €4 per week and a charge of €0.10 per minute for calls.

Network B has a fixed charge of €2 per week and a charge of €0.15 per minute for calls.

Complete the following tables.

Network A			
Call time (Minutes)	Cost of calls	Standing charge	Total Cost
0			
10			
20			
30			
40			

Network B			
Call time (Minutes)	Cost of calls	Standing charge	Total Cost
0			
10			
20			
30			
40			

- From the above tables, which network do you think offers the best deal if Eithan plans to use the phone to make calls for 10 minutes per week? Explain your answer.

- b. From the above tables, which network do you think offers the best deal if Eithan plans to use the phone to make calls for 20 minutes per week? Explain your answer.

- c. From the above tables, which network do you think offers the best deal if Eithan plans to use the phone to make calls for 30 minutes per week? Explain your answer.

- d. From the above tables, which network do you think offers the best deal if Eithan plans to use the phone to make calls for 40 minutes per week? Explain your answer.

- e. Is there a pattern that determines the cost of using Network A? If so state it in words.

- f. What is the formula to represent the cost of using Network A for a week?

- g. Is there a pattern that determines the cost of using Network B. If so state it in words.

- h. What is the formula to represent the cost of using Network B for a week?

- i. Represent the information in the above tables on the same graph.



- j. What would happen to the graph representing Network A if its standing charge was increased to €5 per week?

- k. What would happen to the graph representing Network B if its standing charge was decreased to €0 per week?

- l. Is the graph for each network linear? Give reasons for your answer.

- m. What determines where the line representing each network cuts the y axis?

- n. What determines the rate of change of a line representing a network and what is the rate of change of the line representing Network A?

- o. Take any 2 points on the line representing network A and find the slope between these 2 points.

- p. Is there any relationship between the rate of change of the line representing Network A and the slope of this line? If so state what it is.

- q. What is the rate of change of the line representing Network B?

- r. Take any 2 points on the line representing network B and find the slope between these 2 points.

- s. Is there any relationship between the rate of change of the line representing Network B and the slope of this line? If so state what it is.

- t. Suggest a set of circumstances where one network will always be more expensive than the other.

- u. From the graph estimate how much time has to be spent on calls for both networks to cost the same amount?

- v. Use algebra to calculate the exact call time required so that both networks will have the same total cost.

- w. A new network called Network C entered the market and Network C has a formula of Total Cost = $\text{€}3 + \text{€}0.18t$ (where t is the call time in minutes).

- i. Explain this formula.

- ii. What would the cost of this network be if the call time was 30 minutes?

- iii. Will Network C ever have the same cost as Network A? Explain your answer.

- iv. Will Network C ever have the same cost as Network B? Explain your answer.

Student Activity: To investigate the effect of doubling the amount of pocket money every day given that 2 cent was received on the first day

Use in connection with the interactive file, '2 Cents', on the Student's CD.

- a. A daughter said to her father, "This is the pocket money I would like for this month. I want 2 cents on the first day of the month, 4 cents on the second day, and double that again for the 3rd day ... and so on. That is all I want."

- a. Make a table to show how much money she will get for the first 10 days of the month.

Day	Money received
1	2
2	
3	
4	
5	
6	
7	
8	
9	
10	

- b. Describe in your own words, the pattern that is shown in the above table.

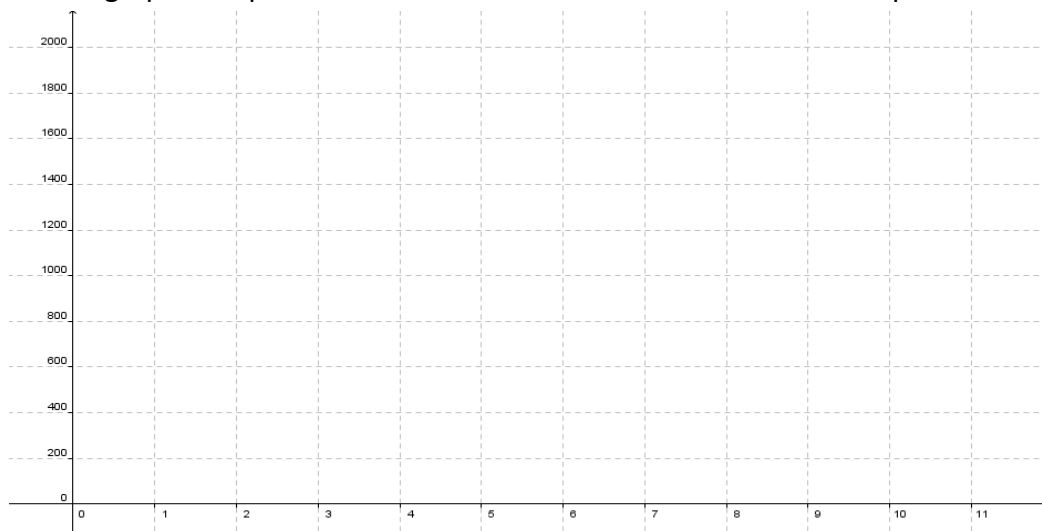
- c. Write down a mathematical formula that would represent the above situation.

- d. Do you think the graph of this relationship is going to be linear or quadratic? If neither, state what type of graph you think it will be. Explain your answer.

- e. Is this a good deal for the daughter or the father? Explain why you choose your answer.

- f. Is the money the daughter gets per day in cents or in Euros? How would you convert it to Euros?

- g. Draw a graph to represent the information contained in the table in part a.



- h. How much money in total will she have at the end of day 10?
-
- i. Using a calculator, calculate how much money she will get on day 30.
-
- j. To see how the situation described in question 1 would differ from a situation where the daughter was told she would get 2 extra cents each day answer the questions below.
- What would be the start amount of money?

 - How much would she have in total at the end of day 10?

 - What would be different about the graphs?

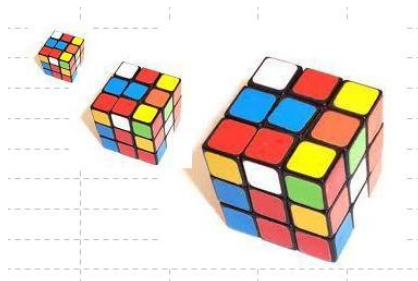
- b. By moving the slider 'a' in the interactive file from 2 to 3, see what happens to the graph if instead of doubling the amount of money each day it was trebled.
- Describe what happened to the graph and how it compares to the first graph.

 - From the table on the interactive file can you work out how much money she receives on day 15 if the amount of money is trebled each day?

 - What is the total amount of money she will have received at the end of day 15?

Student Activity: To investigate the effect changes to side lengths have on the area of the face of a cube, the total surface area of the cube and the volume of a cube

Use in connection with the interactive file, 'Cube', on the Student's CD.



1. Given that the side length of one side of a cube is 2 cms, what is the side length of the other sides of the cube?

2. Complete the following table for cubes of various side lengths:

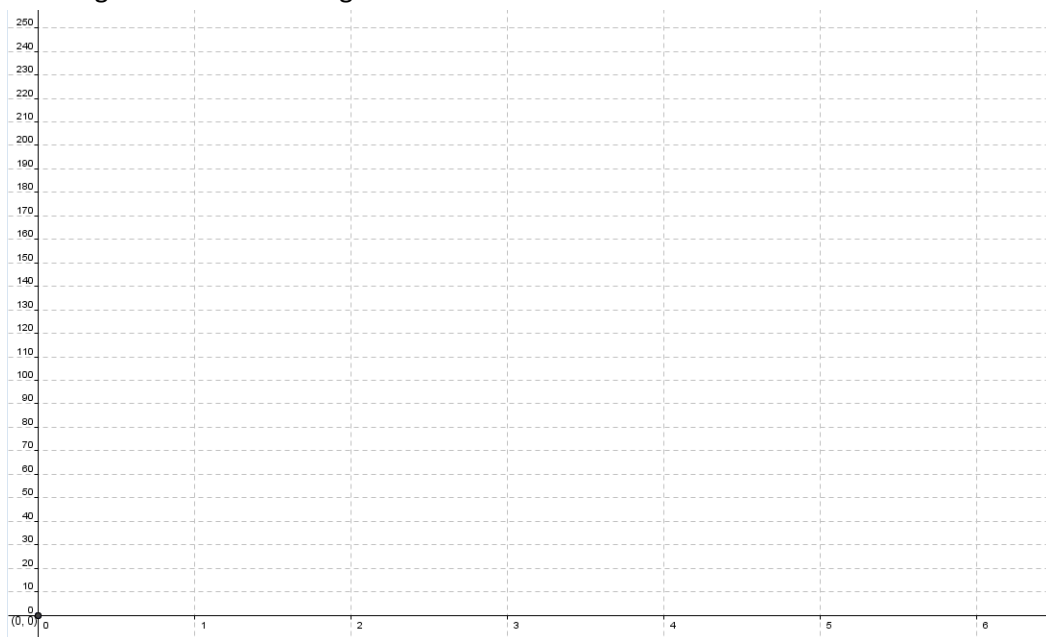
Side length of a cube	Area of 1 face of this cube
0	
1	
2	
3	
4	
5	
6	

3. Write, in your own words, what pattern is formed in the change in the area of one face of a cube as the side length of the cube changes.

4. Write a formula to represent the pattern formed by the change in the area of one face of a cube (A) as the side length (L) of the cube changes.

5. Is the relationship between the side length of the cube and the area of one face of the cube linear, quadratic or exponential? Explain your choice.

6. On the following diagram draw a graph to represent the area of one face of a cube as the side length of the cube changes.



7. Complete the following table for cubes of various side lengths:

Side length of a cube	Total surface area of this cube
0	
1	
2	
3	
4	
5	
6	

8. Write, in your own words, the pattern formed by the change in the total surface area of a cube as the side length of the cube changes.

9. Write a formula to represent the pattern formed by the change in the total surface area of a cube as the side length of the cube changes.

10. Is the relationship between the side length of the cube and the total surface area of the cube linear, quadratic, exponential or none of the above? Explain your choice.

11. On the same diagram as before, draw a graph to represent the change in total surface area of a cube as the side length of the cube changes.
12. Complete the following table for cubes of various side lengths:

Side length of a cube	Volume of this cube
0	
1	
2	
3	
4	
5	
6	

13. Write, in your own words, the pattern formed by the change in the volume of a cube as the side length of the cube changes.

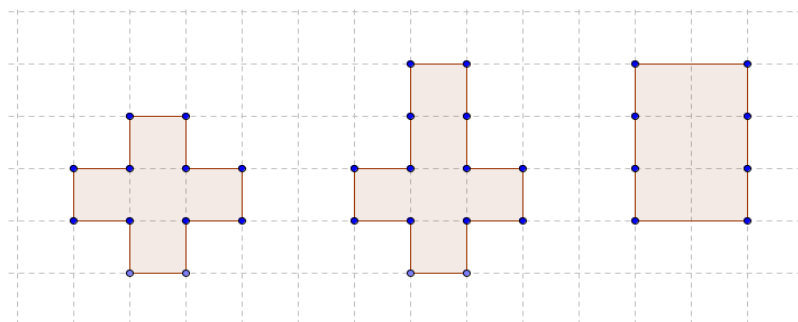
14. Write a formula to represent the pattern formed by the change in the volume of a cube as the side length of the cube changes.

15. Is the relationship between the side length of the cube and the volume of the cube linear, quadratic or exponential? Explain your choice.

16. On the same diagram as before, draw a graph to represent the change in the volume of a cube as the side length of the cube changes.

17. Do your graphs agree with the interactive file?

18. Which of the following nets represents a cube?



19. From the interactive file, is total surface area always greater than volume? Explain your answer.

Challenge

The greater the surface area the faster the object cools and the greater the volume of a living object the greater its heat producing capacity.

20.

- i. What would be the implications of this for a heat producing object with a large volume to surface area ratio?

- ii. What would be the implications for a heat producing object with a small volume to surface area ratio?

21. Why do babies need to be wrapped up very well?

Student Activity: To investigate change and the change of the change

Use in connection with the interactive file, 'Change of the Change', on the Student's CD.

1.

a. Complete the following table for $f(x) = x^2$.

n	x	$U_n = x^2$	Change = any term – previous term	Change of the change = Change – previous change
1	-3		N/A	N/A
2	-2			N/A
3	-1			
4	0			
5	1			
6	2			
7	3			

b. What do you notice about all of the change of the change?

c. What type of graph is given by the function $f(x) = x^2$?

2.

a. Complete the following table for $f(x) = x^2 + 2x + 3$.

n	x	$T_n = x^2 + 2x + 3$	change = any term – previous term	Change of the change = first change – previous change
1	-3			
2	-2			
3	-1			
4	0			
5	1			
6	2			
7	3			

b. What do you notice about all of the change of the change?

c. What type of graph is given by the function $f(x) = x^2 + 2x + 3$?

3. What type of graph does $f(x)$ represent in the interactive file?

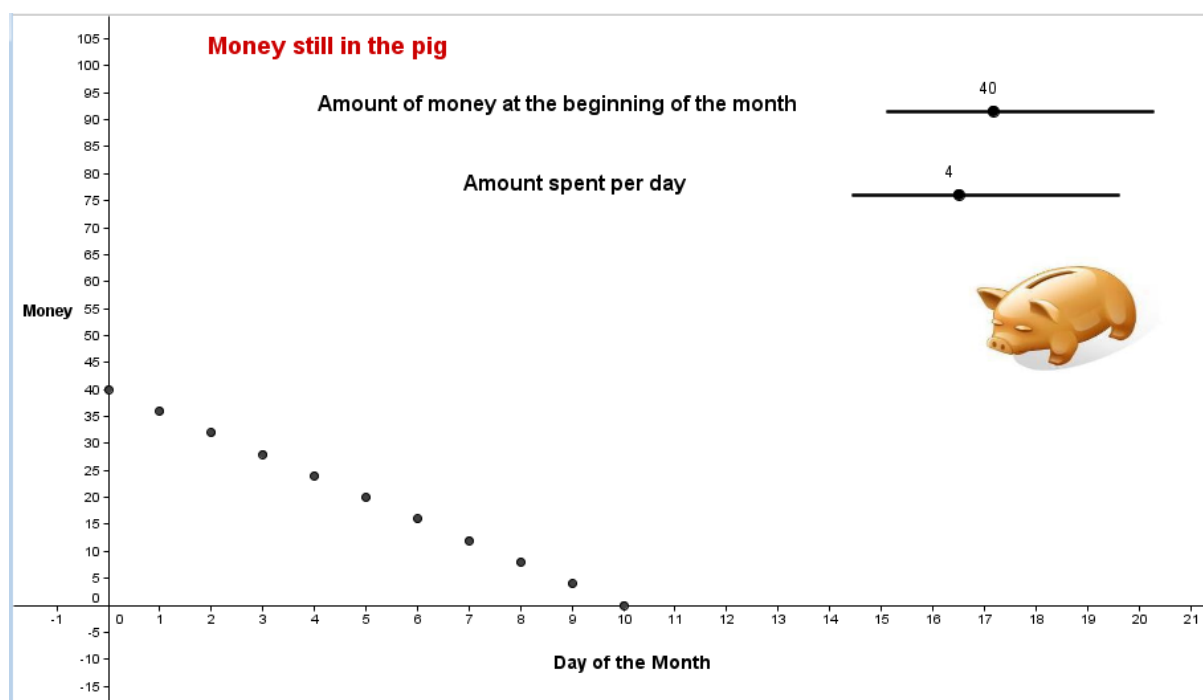
By moving the sliders in the interactive file, what can you conclude about:

a. The change for this type of graph?

b. The change of the change for this type of graph?

Student Activity: To investigate a spending pattern

Use in connection with the interactive file, 'Piggy Bank', on the Student's CD.



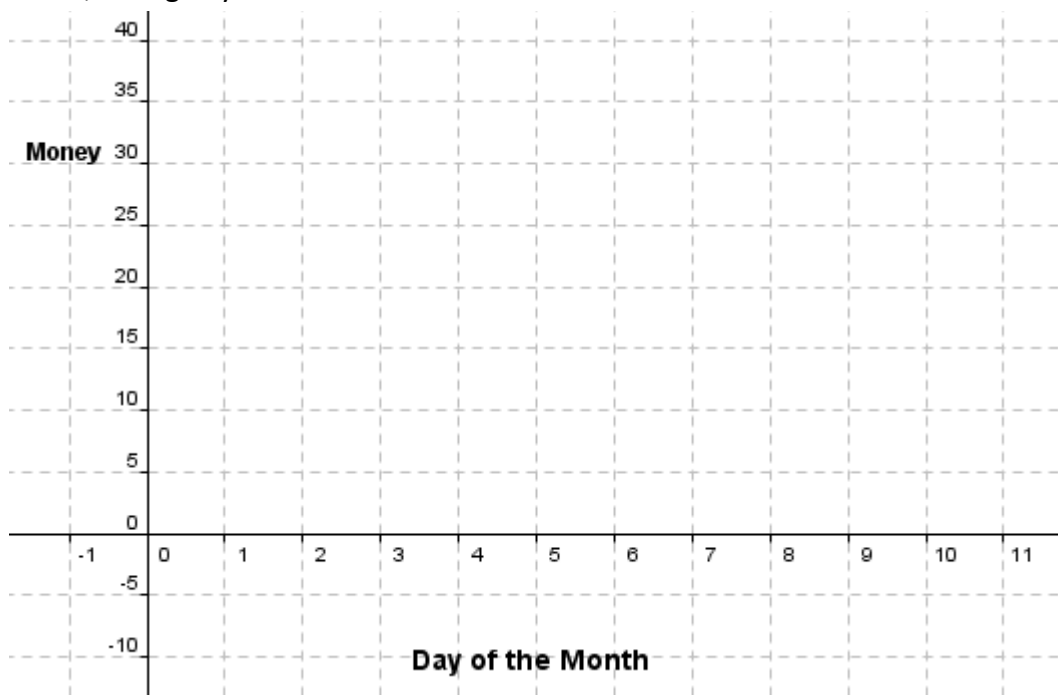
1.

- a. Judith has €40 in her piggy bank and every day after that she spends €4.

Complete the following table:

Day	Money left in the Piggy Bank
0	40
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

- b. Represent the information contained in the table in part **a** in the graph below, taking day 0 to be the start of the month:



- c. Assuming Judith has no other source of income, what happens after day 10?
-
- d. Why are dots used in the interactive file rather than a continuous line to represent the data?
-
- e. Is the rate of change of this graph positive or negative? i.e. is the graph increasing or decreasing? Explain your answer.
-
- f. Take any two points on the diagram and find the slope of the line that would pass through both these points. Repeat this for another set of points.
-
- g. How does the slope of the line between any two points relate to the story about the piggy bank at the start?
-
- h. Where on the graph does the starting amount appear? Explain your answer.
-

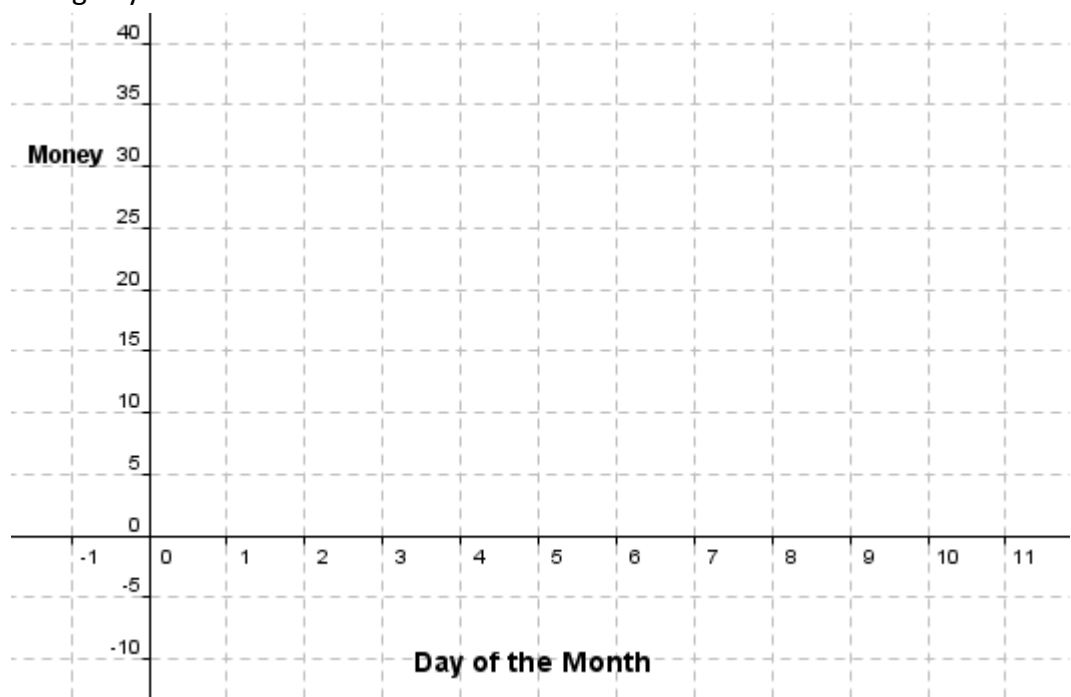
2.

- a. Peter has €25 in his piggy bank and every day after that he spends €3.

Complete the following table:

Day	Money left in the Piggy Bank
0	25
1	
2	
3	
4	
5	
6	
7	
8	

- b. Represent the information contained in the table in part **a** in the graph below taking day 0 to be the start of the month:.



- c. Assuming Peter has no other source of income, what happens after day 9?

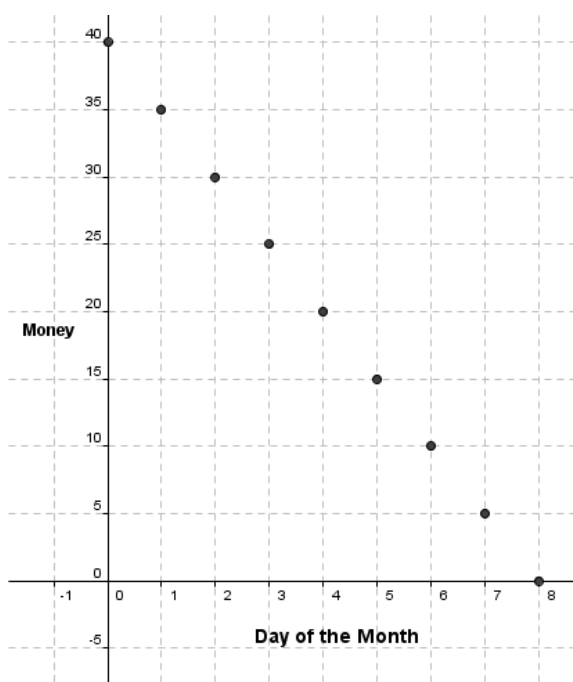
- d. Why are dots more appropriate in the graph, rather than a continuous line to represent the data?

- e. Is the rate of change of this graph positive or negative? i.e. is the graph increasing or decreasing? Explain your answer.
-
- f. Take any two points on the diagram and find the slope of the line that would pass through both these points. Repeat for another set of points.
-
- g. How does the answer for the slope of the line between any two points relate to the story about the piggy bank at the start?
-
- h. Where on the graph does the starting amount appear? Explain your answer.
-

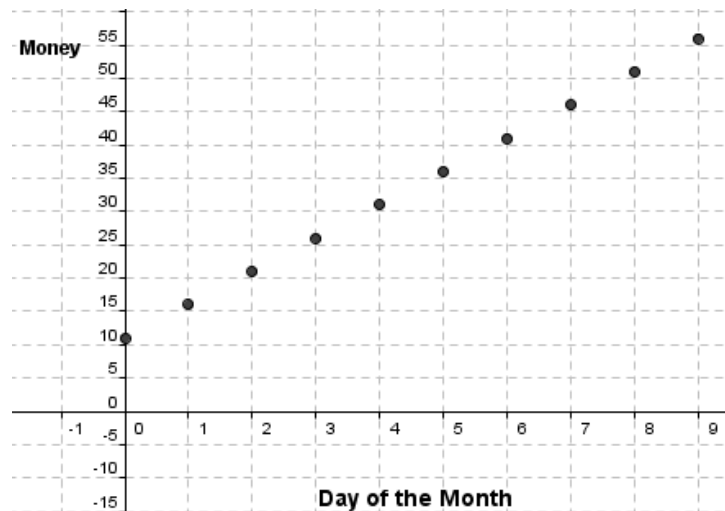
3. Assuming the diagram below represents a money box:

- a. How much money had this student at the beginning of the month (i.e at day 0)? Explain your answer.
-

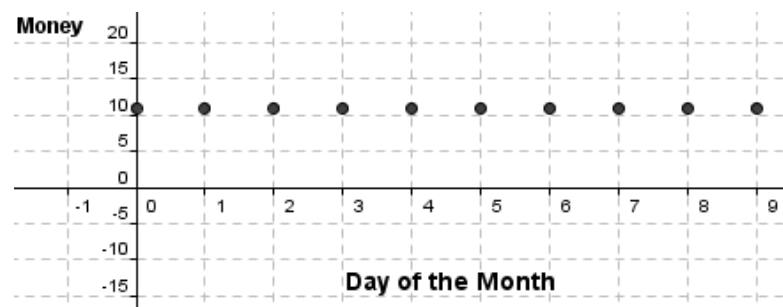
- b. How much money did this student spend per day? Explain your answer.
-



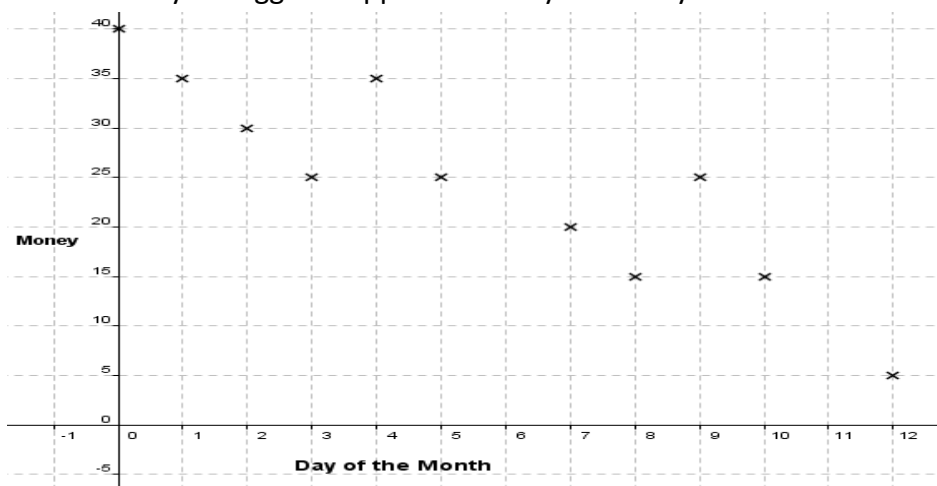
4. Assuming the graph below represents the money in of another student's piggy bank, can you explain what is happening to the money in this student's piggy bank starting at the beginning of the month?



5. Assuming the graph below represents the spending pattern of another student can you explain what is happening to the money in this student's piggy bank? Explain your answer.

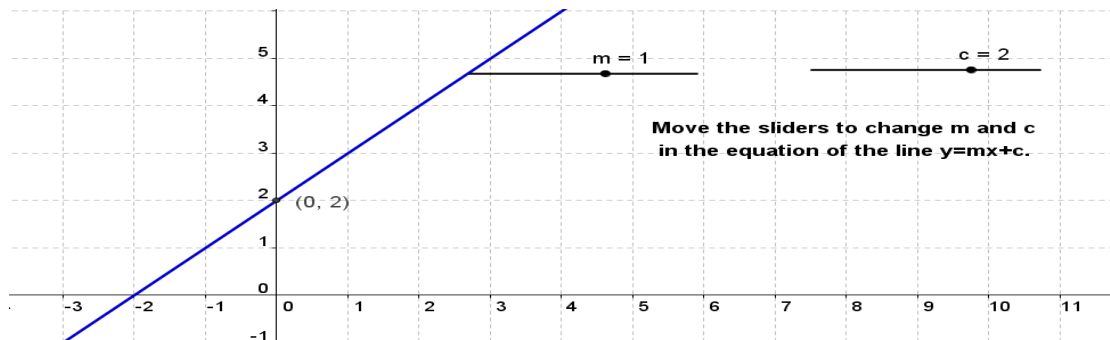


6. What would you suggest happened on day 4 and day 9 to this student's money?



Student Activity: To investigate $y=mx+c$

Use in connection with the Interactive file, ' $y=mx+c$ ', on the Student's CD.

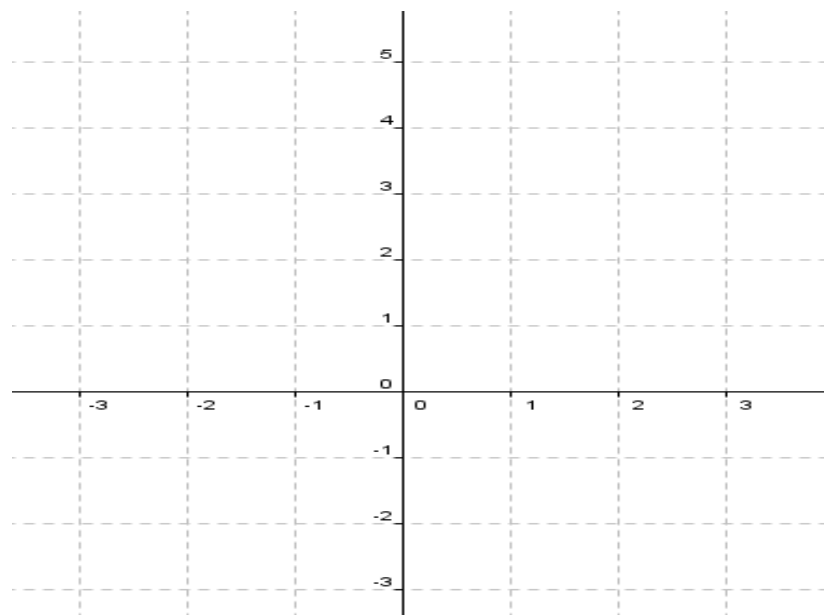


1.

- a. Given that $m=2$ and $c=1$ complete the following table:

x	$y = mx+c$
-2	
-1	
0	
1	
2	

- b. Represent the data in the table above in the graph below.



- c. Where did the graph intersect the x axis?

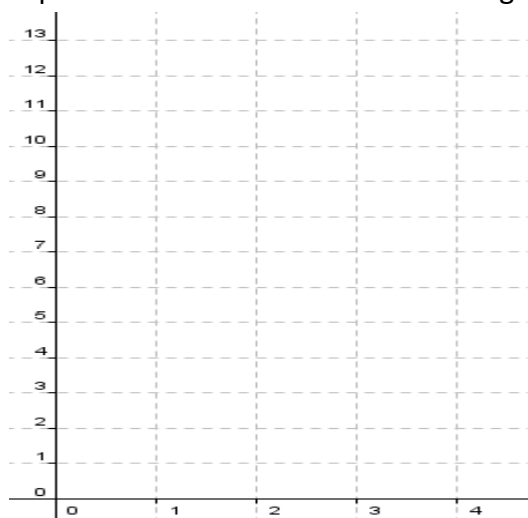
- d. What is the rate of change in y per unit change in x of this graph? Does this value relate to m or c and if so how?

2.

- a. Given that $m=3$ and $c=1$ complete the following table:

x	$y = mx+c$
0	
1	
2	
3	
4	

- b. Represent the data in the table in the graph below.



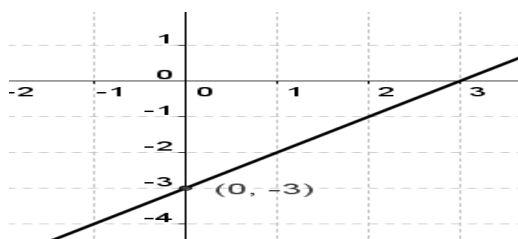
- c. Where did the graph intersect the x axis?

- d. What is the rate of change in y per unit change in x of this graph? Does this value relate to m or c and if so how?

3. Using the interactive file state what impact a change in c has on the shape of the graph and where the graph cuts the y axis?

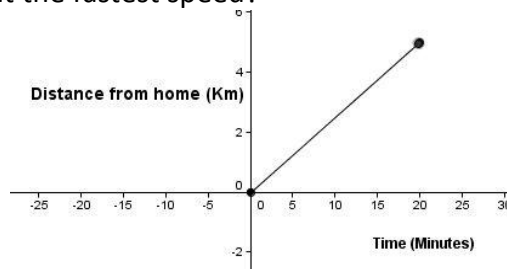
4. Using the interactive file state what impact a change in m has on the shape of the graph?

5. Given that the equation of this line is of the form $y = mx+c$, what is the value of c and m ?

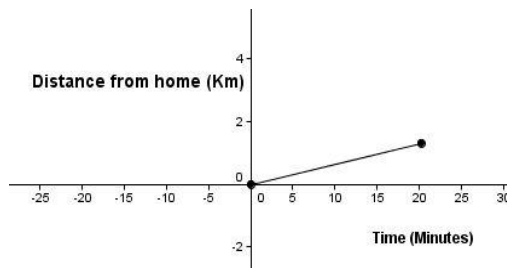


Relations without Formulae Quiz

1. Given that these graphs represent someone cycling, in which graph is the cyclist moving at the fastest speed?



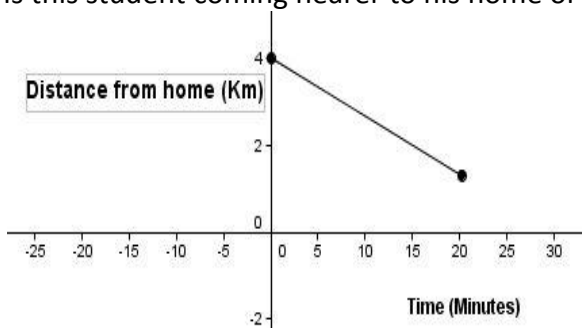
Graph A.



Graph B.

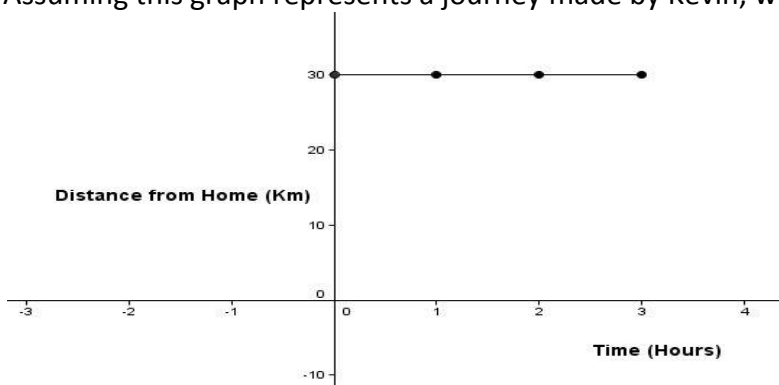
- A. A.
B. B.

2. Is this student coming nearer to his home or moving away from his home?

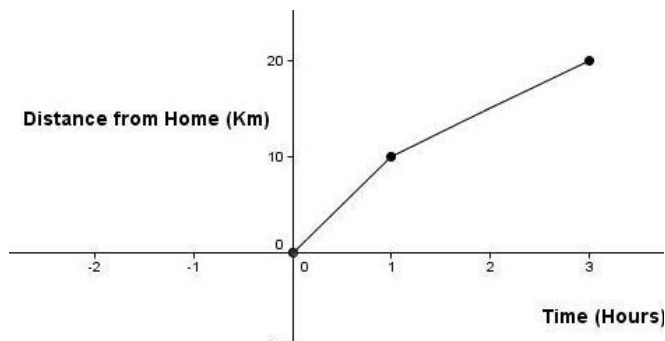


- A. He is coming nearer his home
B. He is moving away from his home

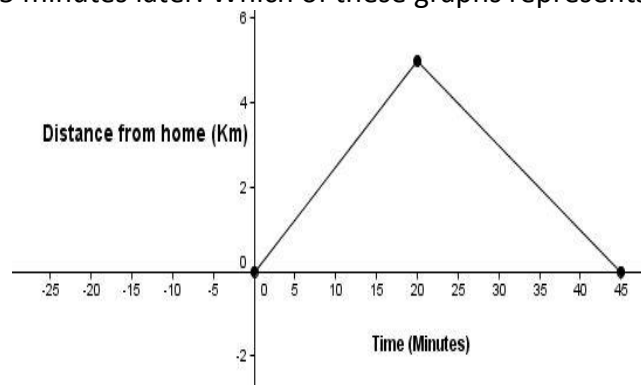
3. Assuming this graph represents a journey made by Kevin, which story is true?



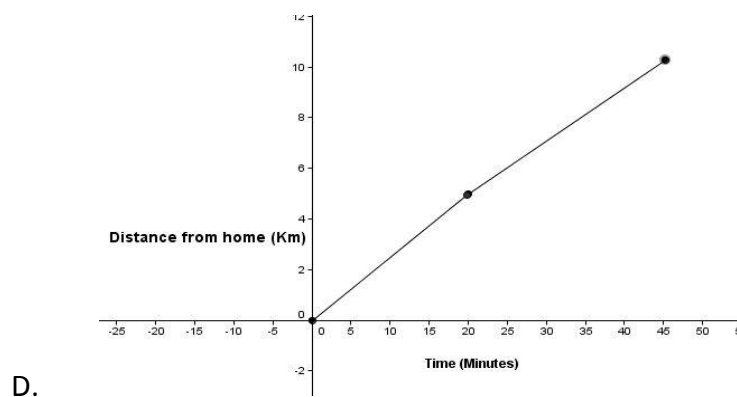
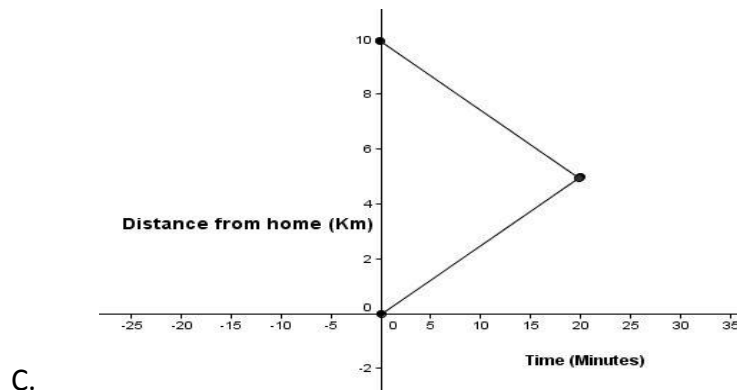
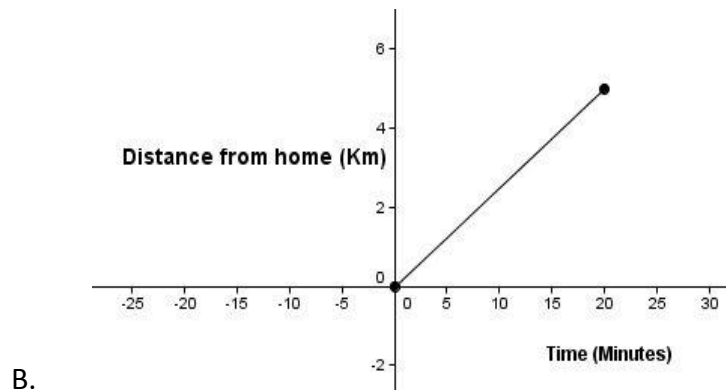
- A. Kevin started his journey 30 km from home and arrived home after 3 hours.
- B. Kevin started his journey 30 km from home and did not move for the 3 hours shown in the graph.
- C. Kevin started his journey and travelled 3 km in 30 minutes.
4. Assuming this graph represents a journey made by Freda, which story is represented in the graph?



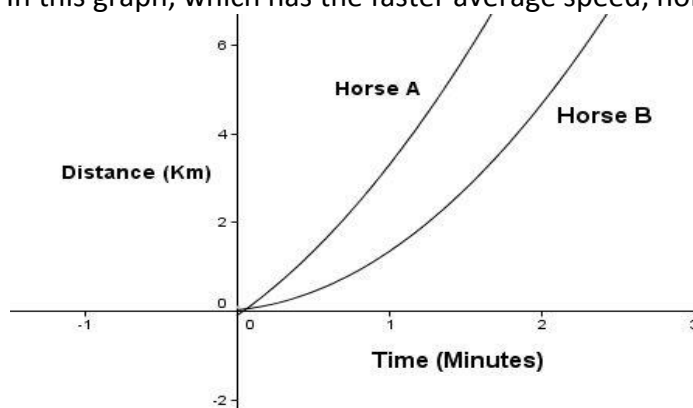
- A. In the first hour Freda travels at 10 km per hour and in the next hour she travels 20km.
- B. In the first hour Freda travels at 10 km per hour and in the next 2 hours she travels 10 km per hour.
- C. In the first hour Freda travels at 10 km per hour and in the next 2 hours she travels another 10km.
- D. In the first hour Freda travels at 10 km per hour and in the next hour she travels 10 km.
5. Fergus is a runner. He runs from his house at a steady speed until he gets to a marker, which is a distance of 5 kilometres from home, taking 20 minutes to do it. He immediately turns for home and runs at a slower, steady speed, arriving back a further 25 minutes later. Which of these graphs represents Fergus's run?



A.

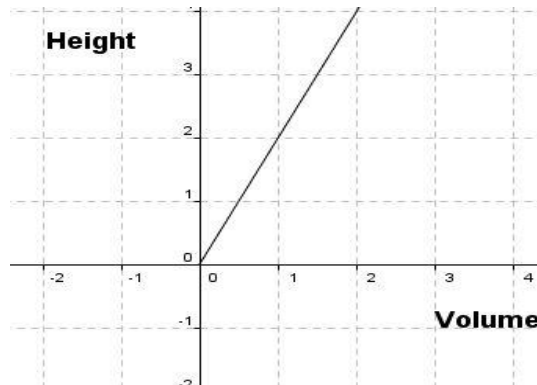


6. In this graph, which has the faster average speed, horse A or horse B?

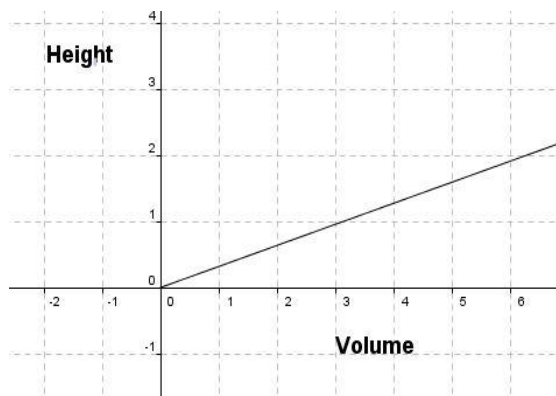


- A. Horse A
- B. Horse B

7. Given that the following diagrams represents volume vs. height of a cylindrical shaped container, which of the following diagrams will represent the cylinder with the larger radius?



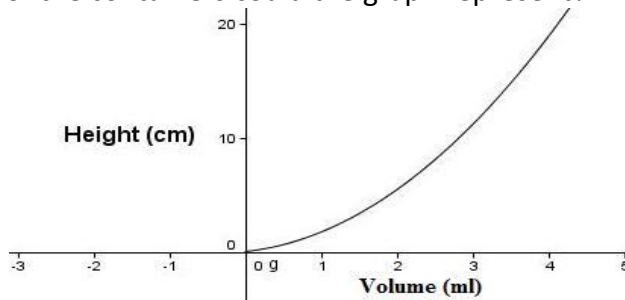
Graph A.



Graph B.

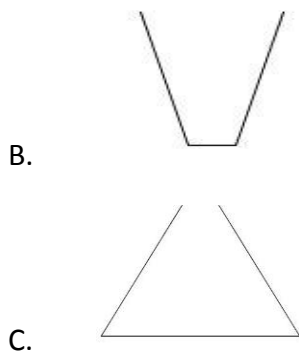
- A. A.
B. B.

8. This graph represents the volume of liquid in a container vs. the height of the liquid. The diagrams below are 2-dimensional representations of possible containers. Which of the containers could the graph represent?

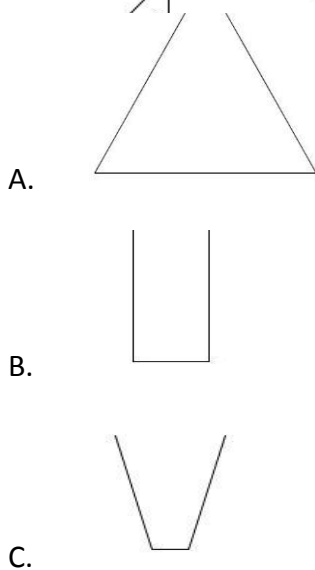
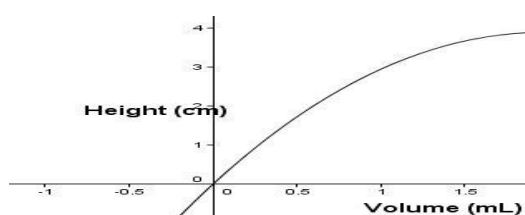


- A.

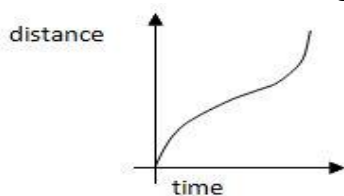




9. This graph represents the volume of liquid in a container vs. the height of the liquid. The diagrams below are 2-dimensional representations of possible containers. Which of the containers could the graph represent?



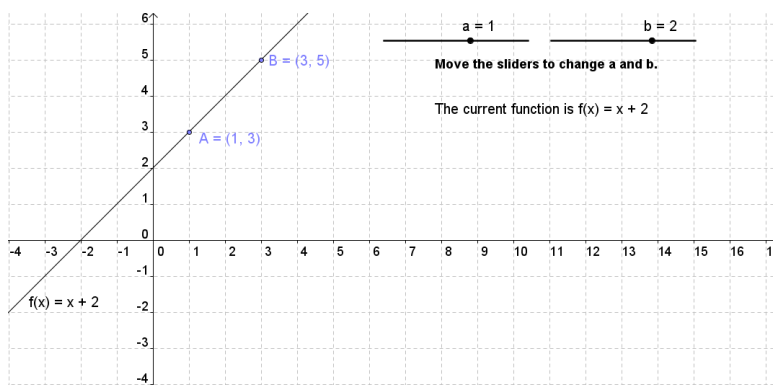
10. Match this time vs. distance graph with the correct statement.



- A. Moving at steady, moderate pace
- B. Moving at a very fast pace, then moving gradually to a slower pace
- C. Moving at a fast, steady pace
- D. Moving fast, then slowing slightly, then going faster again

Student Activity: To investigate functions of the form $f(x) = ax + b$

Use in connection with the interactive file, ' $f(x) = ax + b$ ', on the student's CD.



1. Use the interactive file to find where the line representing the function $f(x) = x + 3$ cuts the y axis.

2. Use the interactive file to find where the line representing the function $f(x) = 2x + 4$ cuts the y axis.

3. Use the interactive file to find where the line representing the function $f(x) = 3x + 2$ cuts the y axis.

4. Use the interactive file to determine where the line representing the function $f(x) = ax + b$ cuts the y axis. Explain your reason.

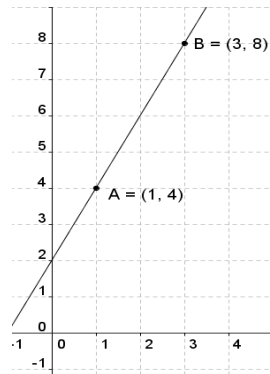
5. Set the interactive slider a at 2 and slider b at 3.
 - a. Move the point A in the interactive file to check if the point $(1, 5)$ is on the line representing the function $f(x) = 2x + 3$.

 - b. Move the point B in the interactive file to check if the point $(2, 7)$ is on the line representing the function $f(x) = 2x + 3$.

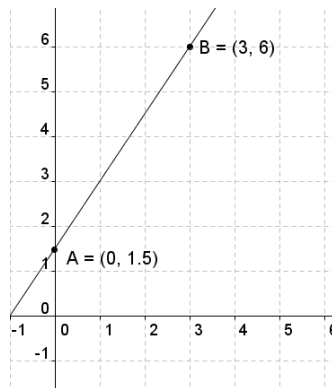
 - c. Find the slope of the line containing the points $(1, 5)$ and $(2, 7)$.

- d. Where in the format of the function $f(x) = 2x + 3$ do you find the value for the slope that you got in the previous section?
-
6. Set the interactive slider a at 3 and slider b at 4.
- a. Move the point A in the interactive file to check if the point (0, 4) is on the line representing the function $f(x) = 3x + 4$.
-
- b. Move the point B in the interactive file to check if the point (1, 7) is on the line representing the function $f(x) = 3x + 4$.
-
- c. Find the slope of the line containing the points (0, 4) and (1, 7).
-
- d. Where in the format of the function $f(x) = 3x + 4$ do you find the value for the slope that you got in the previous section?
-
7. Using the interactive file what can you conclude about the slope of the line representing the function $f(x) = ax + b$? Explain.
-
8. Where will the line representing the function $f(x) = 2x + 4$ cut the x axis and what will its slope be?
-
9. Where will the line representing the function $f(x) = 5x + 1$ cut the x axis and what will its slope be?
-
10. Where will the line representing the function $f(x) = -\frac{1}{2}x + 4$ cut the x axis and what will its slope be?
-
11. Where will the line representing the function $f(x) = -3x + \frac{3}{4}$ cut the x axis and what will its slope be?
-

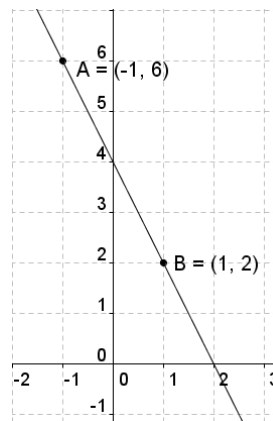
12. What function is the line in the following graph representing?



13. What function is the line in the following graph representing?

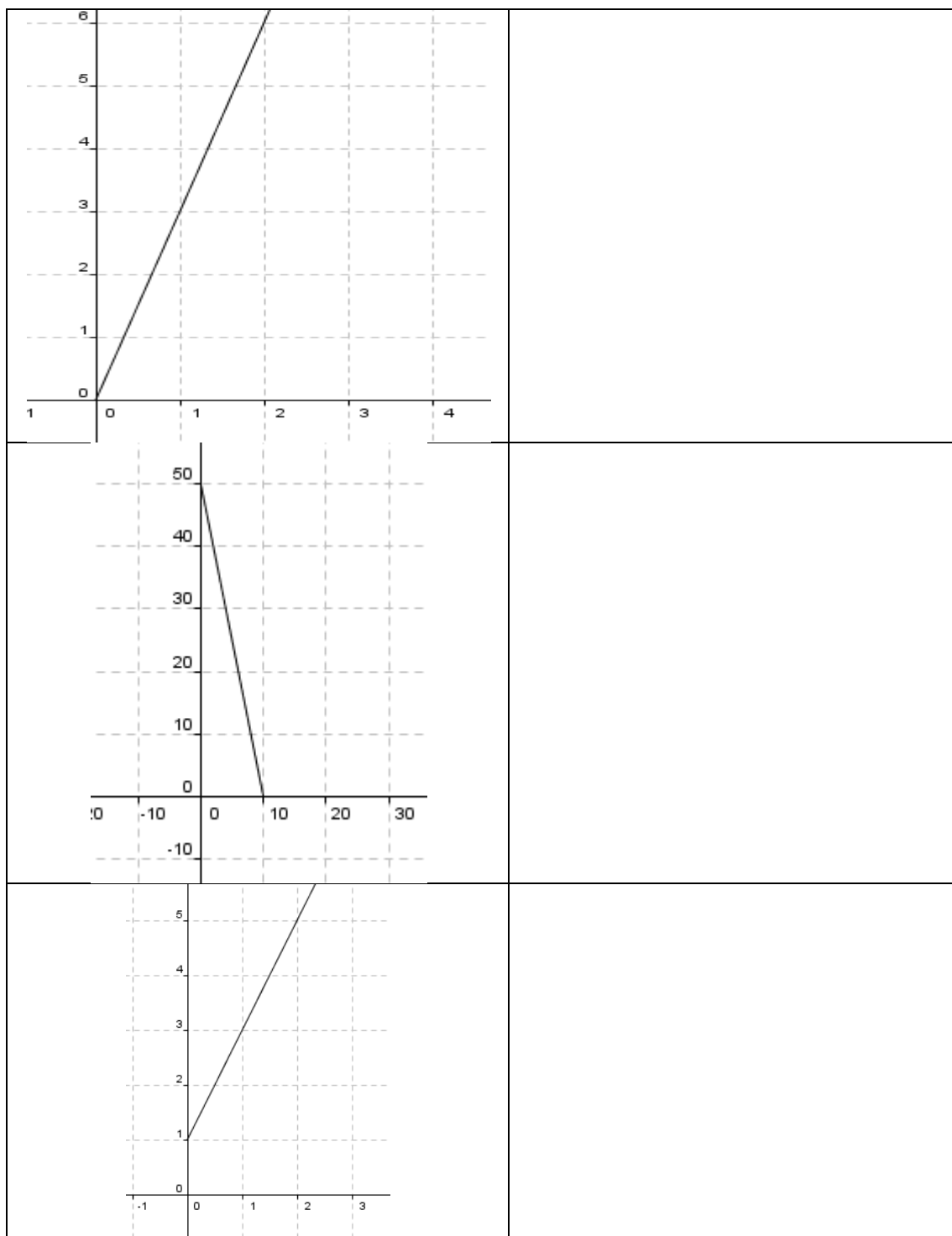


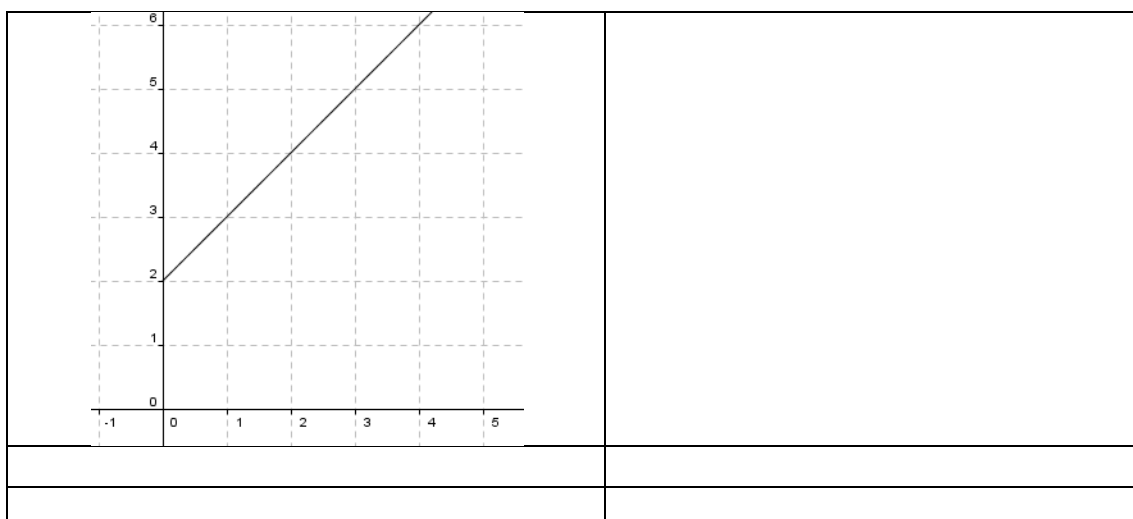
14. What function is the line in the following graph representing?



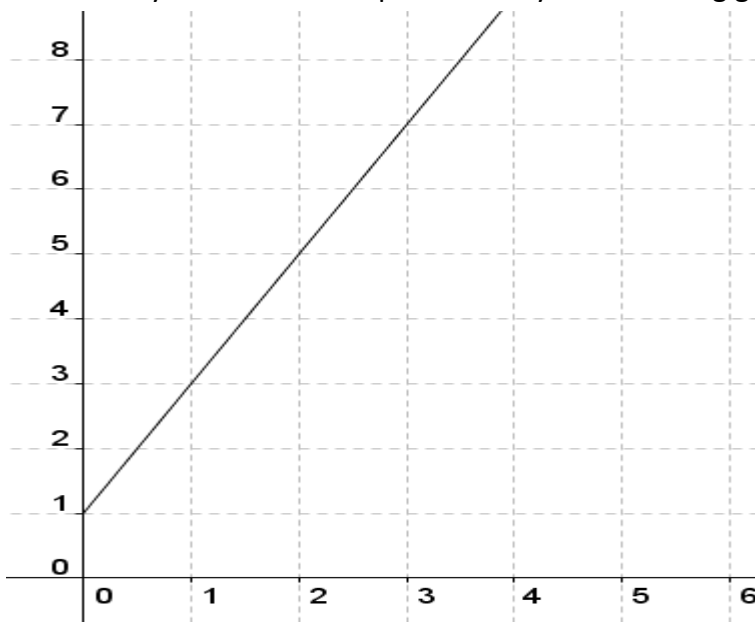
15. Match the following stories with their corresponding graphs:

- A gardener buys a tree 1 metre high and it grows 2 metres every year.
- A car park charges €1 on entry and €2 per hour after that.
- An amusement park charges each person €3 per hour of his/her stay.
- A teenager has €50 and spends €5 per week.

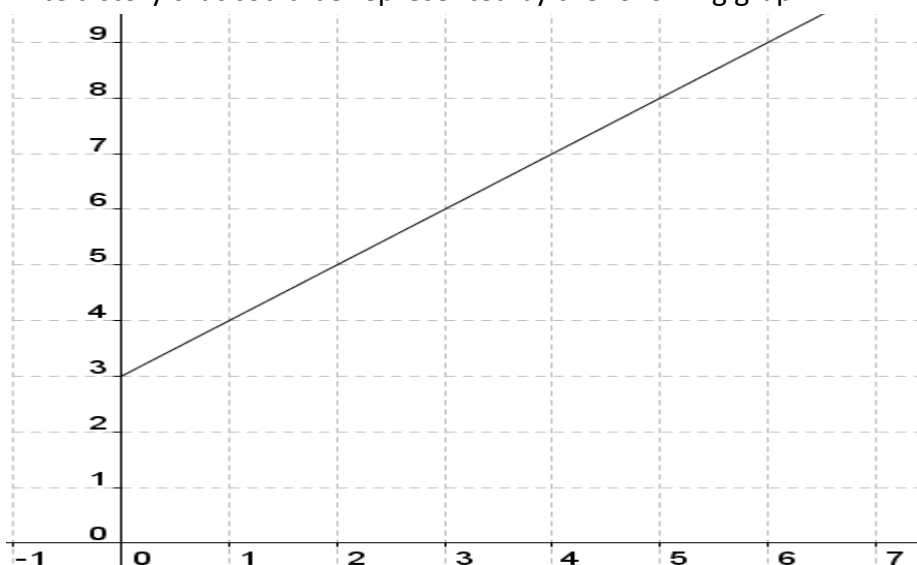




16. Write a story that could be represented by the following graph.

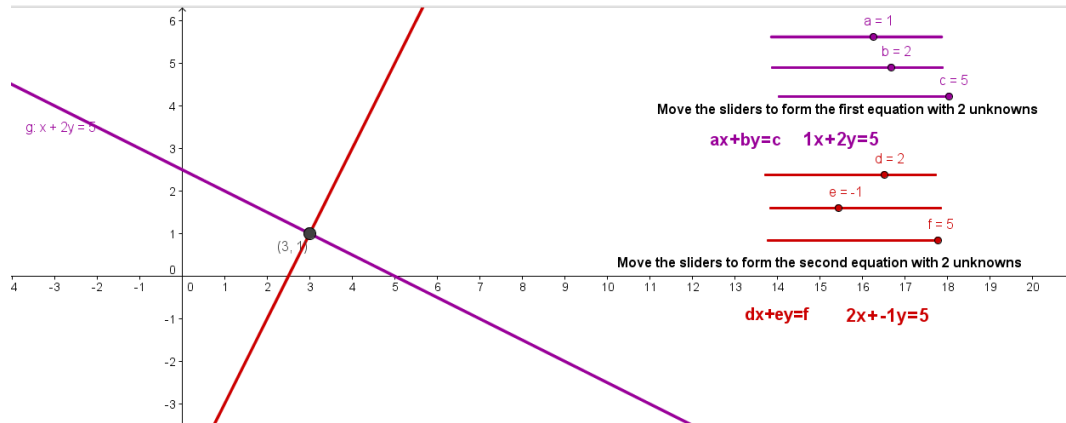


17. Write a story that could be represented by the following graph.



Student Activity: To investigate the solution of two simultaneous equations with two unknowns

Use in connection with the interactive file, 'Simultaneous Equations of 2 Unknowns', on the Student's CD.

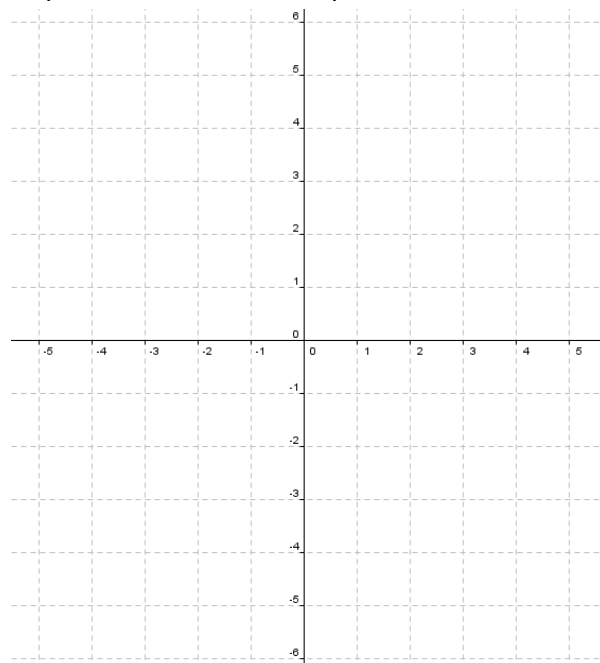


1.

a. Complete the following table:

-x	$y=2x+1$	$y=x+3$
-3		
-2		
-1		
0		
1		
2		
3		

b. Draw a graph to represent each of the equations in the above table.



- c. Where do the lines representing $y = 2x + 1$ and $y = x + 3$ meet?

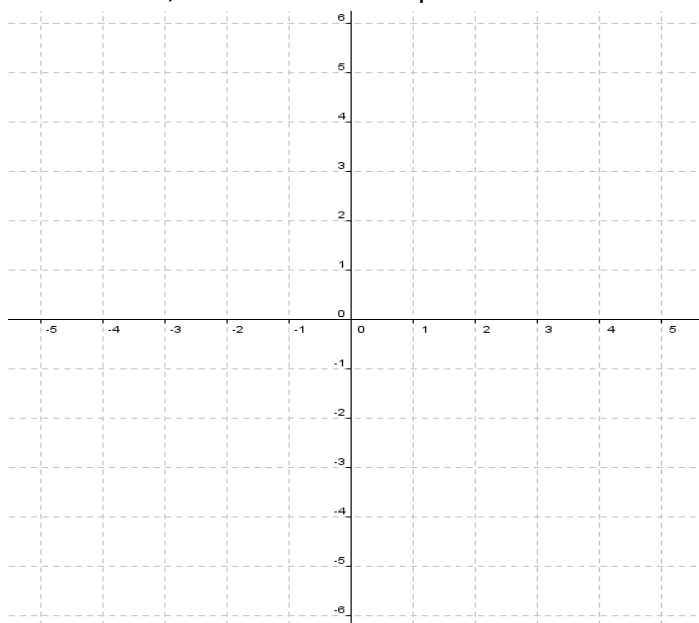
- d. Hence, what are the co-ordinates of the point which satisfies both $y = 2x + 1$ and $y = x + 3$?

- e. Hence, solve $y = 2x + 1$ and $y = x + 3$.

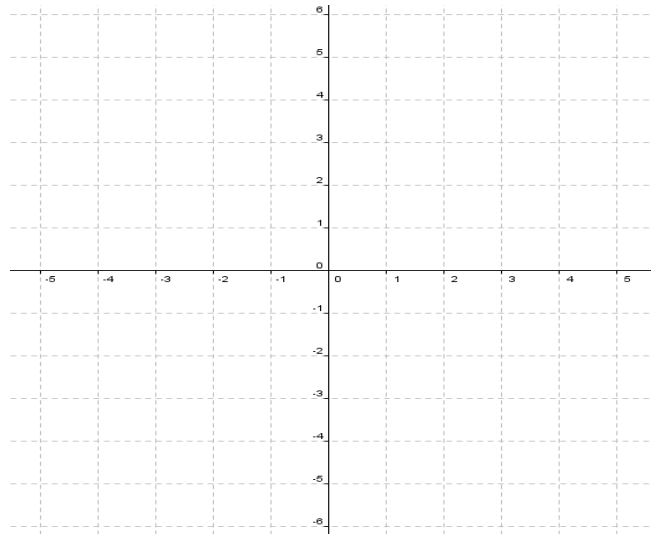
2. Given $2x + y = 6$, write y in terms of x .

3. What is the minimum number of points required to draw a line?

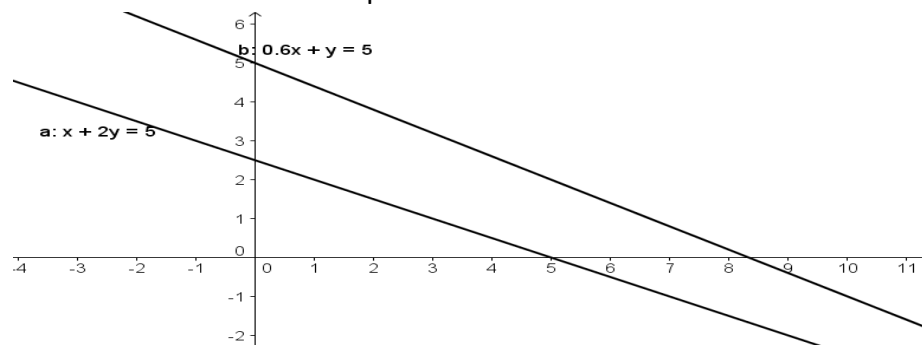
4. Using the same axes and scale, draw the lines $x + y = 3$ and $3x + y = 7$. Where do these lines intersect? Hence, solve this set of equations.



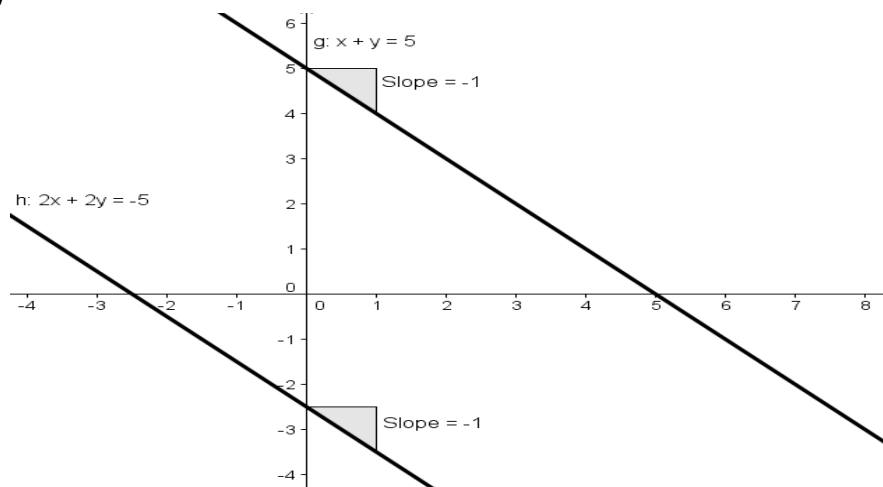
5. Using the same axes and scale, draw the lines $2x + 3y = 5$ and $1x + 3y = 2.5$. Where do these lines intersect? Hence, solve this set of equations.



6. From looking at the diagram below, is it possible to determine if $x + 2y = 5$ and $0.6x + y = 5$ form a set of simultaneous equations.



7. Given that the lines g and h have each slope of 1, as represented on the diagram below, are there any points that satisfy both the equations $x + y = 5$ and $-2x - 2y = 5$? Explain your answer.



The following equations can be done graphically or algebraically

8. In the school canteen, 1 roll and 2 pieces of fruit cost €4.20 and 3 rolls and 1 piece of fruit cost €9.60. Write two equations in terms of x and y to represent this information. Solve these equations to find the cost of a roll and the cost of a piece of fruit.

9. John is the owner of a shop. If he hires 4 sales assistants and 1 security guard, his daily payroll is €480, while 2 sales assistants and 1 security guard require a daily payroll of €300. Write two equations in terms of x and y to represent this information. Solve these equations. What are the daily wage of a sales assistant and the daily wage of a security guard?

10. The sum of two numbers, a and b , is 45 and their difference is 3. Write two equations in terms of a and b to represent this information. Solve these equations to find the two numbers.

11. 5 oranges and 3 apples cost €2.10 and 3 oranges and 1 apple cost €1.10. Write two equations in terms of x and y to represent this information. Solve these equations to find the cost of an orange and the cost of an apple.

12. There are a number of rabbits and budgies in a cage. Altogether there are 29 heads and 98 legs. Represent this problem as two equations and solve the equations. How many of each type of animal are in the cage?

13. Write a story that the following set of simultaneous equation could represent:

$$2x + y = 11 \qquad x - 2y = 3$$

Challenge

14. A car park charges € a to enter and € b per hour after that. John pays €14 for 4 hours parking and Sara pays €20 for 6 hours parking. Write two equations in terms of a and b to represent this information. Solve these equations to find the cost to enter the car park and the cost per hour of parking.

Introducing Equations Quiz

1. Jane spent €40 on shoes. This was €14 less than what she spent on a handbag. How much did she spend on the handbag?
 - A. €26
 - B. €54
 - C. €27
 - D. €13

2. Jane spent €x on shoes. This was €14 less than what she spent on a handbag. How much was the handbag?
 - A. €x
 - B. €(x+14)
 - C. €(x-14)
 - D. €14x

3. Jillian spent €x on shoes. This was €12 more than what she spent on a handbag. How much was the handbag?
 - A. ?€(x+12)
 - B. €x/12
 - C. €12x
 - D. €(x-12)

4. Marion spent €y on shoes. This was three times more than what she spent on a scarf. How much was the scarf?
 - A. €3y
 - B. €(y/3)
 - C. €(y+3)
 - D. €(y-3)

5. Peter spent €y on shoes. This was three times less than what he spent on a jacket. How much was the jacket?

A. €3y	B. €3/y
C. €(3+y)	D. €(3-y)

6. Let x be the number of boys in the class. This is three more than the number of girls in this class. How many girls are in the class?
- A. $x+3$
- B. $x-3$
- C. $3x$
7. Let x be the number of boys in the class. This is four times the number of girls in this class. How many girls are in the class?
- A. $x+4$
- B. $x-4$
- C. $x/4$
- D. $4x$
8. Let x be the number of boys in the class. There are four less girls than boys in this class. How many girls are in the class?
- A. $x-4$
- B. $x+4$
- C. $4x$
- D. $x/4$
9. A class of 30 students is divided into three groups; one group has 6 more than each of the other 2 groups which have equal numbers. How many are in each group?
- A. 12, 12 and 6
- B. 10, 10 and 10
- C. 13, 13 and 4
- D. 8, 8 and 14
10. A class of 30 students is divided into three groups; one group has 6 less than each of the other 2 groups which have equal numbers. How many are in each group?
- A. 10, 10 and 10
- B. 12, 6 and 6
- C. 12, 12 and 6
- D. 12, 12 and 12

11. Divide €40 between 4 people so the second person has twice as much as the first person, the third person has three times as much as the first person and the fourth person has four times as much as first person. How much does each get?
- A. 10, 12, 13 and 14
 - B. 1, 2, 3 and 4
 - C. 4, 8, 12 and 16
12. Given x is divided among 5 people, how much does each get?
- A. $5x$
 - B. $x/5$
 - C. $x+5$
13. Divide €42 between 4 people, so that the second person will have one euro more than the first person, the third will have 2 euro more than the first person and the fourth will have 3 euro more than the first person. How much does each get?
- A. €10, €11, €12 and €13
 - B. €10.50, €11.50, €12.50 and €13.50
 - C. €9, €10, €11 and €12
14. John got 48 in his test, which is 8 more than what Roy got and Margaret got twice as many marks as Roy. How many marks did Margaret get?
- A. 80
 - B. 96
 - C. 50
15. The width of a rectangular field is 30 metres longer than its length and the perimeter of the field is 560 metres. Find the length of the field.
- A. 140 metres
 - B. 125 metres
 - C. 155
16. The width of a rectangular field is 10 metres longer than its length. In terms of x , what is the perimeter of the field?

- A. $4x$
- B. $4x+20$
- C. $2x+40$
- D. $4x+10$

17. The length of a rectangular field is equal to twice its width and the perimeter of the field is x metres. Find the width of the field in terms of x .

- A. 15
- B. $60-x$
- C. $60-2x$
- D. $x/6$

18. One box of tiles covers a floor area of 2.5 metres squared. How many boxes will it take to cover 250 square metres?

- A. 100
- B. 10
- C. 25

19. One box of tiles covers a floor area of y metres squared. How many boxes in terms of y will it take to cover 250 square metres?

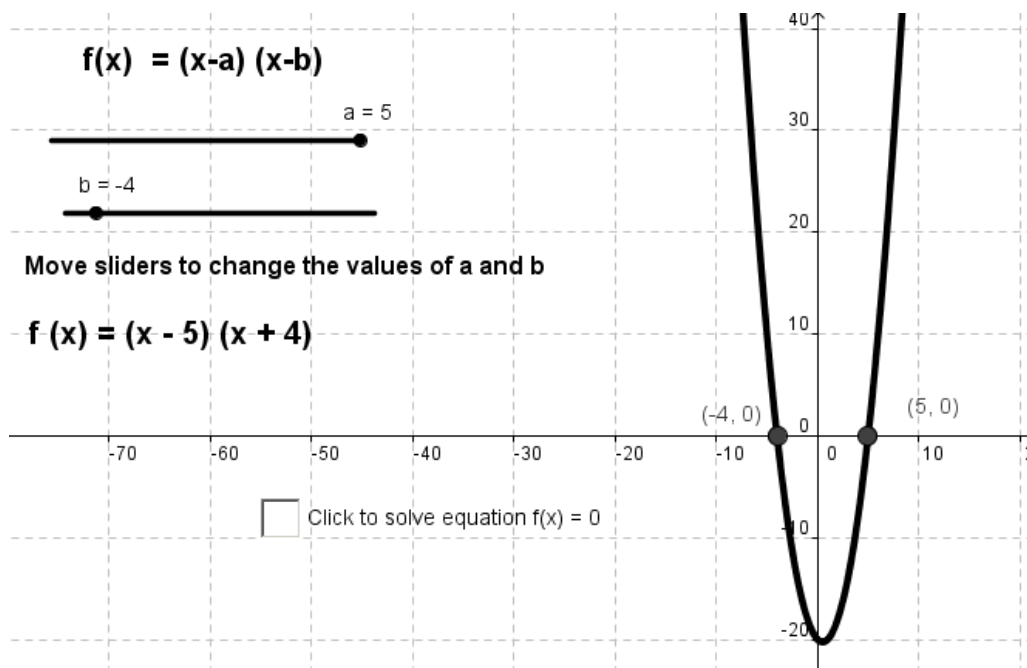
- A. $250y$
- B. $250/y$
- C. $250+y$

20. Three consecutive numbers add up to 63. Given the first of these numbers is x , what is 63 equal to in terms of x ?

- A. $3x$
- B. $x+3$
- C. $3x+3$
- D. $3x+4$

Student Activity: To investigate how to solve $f(x) = (x - a)(x - b)$

Use in connection with the Interactive file, ' $(x - a)(x - b)$ ', on the Student's CD.



Note: Solving the equation $(x - a)(x - b) = 0$ is the same as solving $f(x) = 0$. So we can find the roots of the equation $(x - a)(x - b) = 0$ by taking the x -values of the points where $f(x)$ cuts the x -axis.

1.

- a. Using the interactive file, find where the function $f(x) = (x - 2)(x - 5)$ cuts the x axis.

- b. Hence solve the equation $(x - 2)(x - 5) = 0$.

- c. By substituting your solution(s) for x into $f(x)$, check that $f(x)$ is equal to 0 at these point(s).

2.

- a. Using the interactive file, find where the function $f(x) = (x - 1)(x - 5)$ cuts the x axis.

- b. Hence solve the equation $(x - 1)(x - 5) = 0$.

- c. By substituting your solution(s) for x into $f(x)$, check that $f(x)$ is equal to 0 at these point(s).

3.

- a. Using the interactive file, find where the function $f(x) = (x + 1)(x - 5)$ cuts the x axis.

- b. Hence solve the equation $(x + 1)(x - 5) = 0$.

- c. By substituting your solution(s) for x into $f(x)$, check that $f(x)$ is equal to 0 at these point(s).

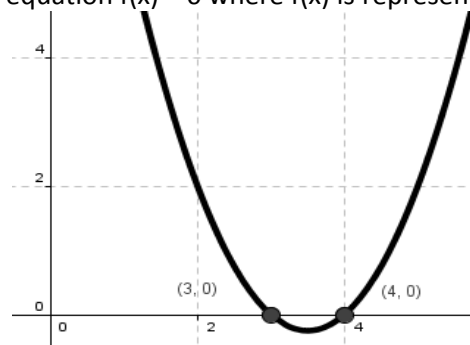
4.

- a. Using the interactive file, find where the function $f(x) = (x + 1)(x + 5)$ cuts the x axis.

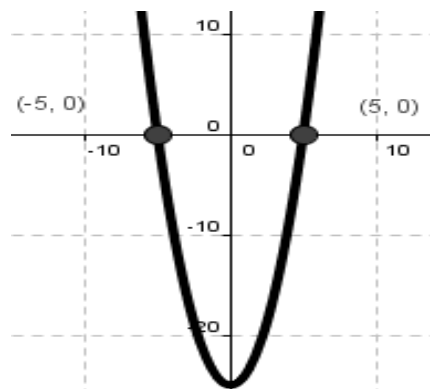
- b. Hence solve the equation $(x+1)(x+5) = 0$.

- c. By substituting your solution(s) for x into $f(x)$, check that $f(x)$ is equal to 0 at these point(s).

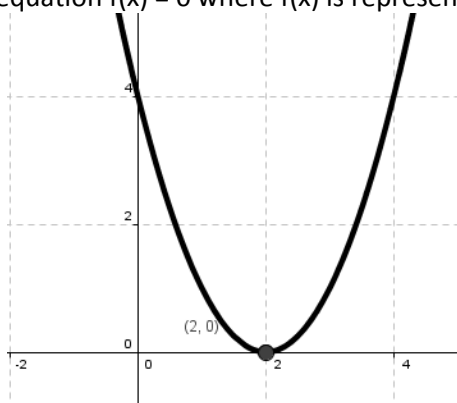
5. Find the solution(s) to the equation $f(x) = 0$ where $f(x)$ is represented on the graph below.



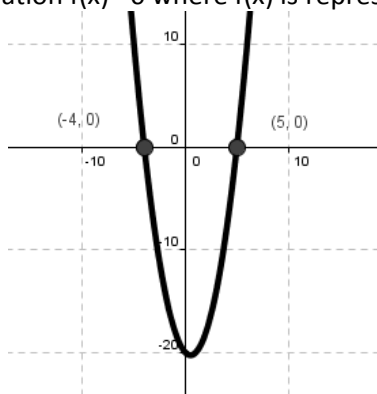
6. Find the solution(s) to the equation $f(x) = 0$ where $f(x)$ is represented on the graph below.



7. Find the solution(s) to the equation $f(x) = 0$ where $f(x)$ is represented on the graph below.



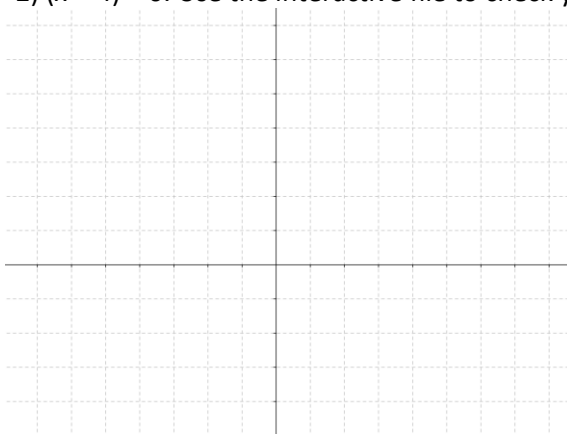
8. Find the solution(s) to the equation $f(x) = 0$ where $f(x)$ is represented on the graph below.



9. When does an equation of the form $f(x) = (x - a)(x - b) = 0$ have only one solution?

10. Draw a rough sketch of the function $f(x) = (x - 2)(x - 4)$.

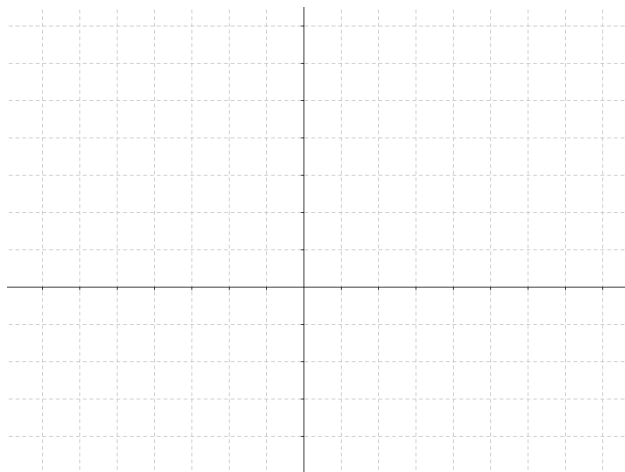
Solve the equation $(x - 2)(x - 4) = 0$. Use the interactive file to check your answers.



11. Draw a rough sketch of the function

$$f(x) = (x+3)(x+1).$$

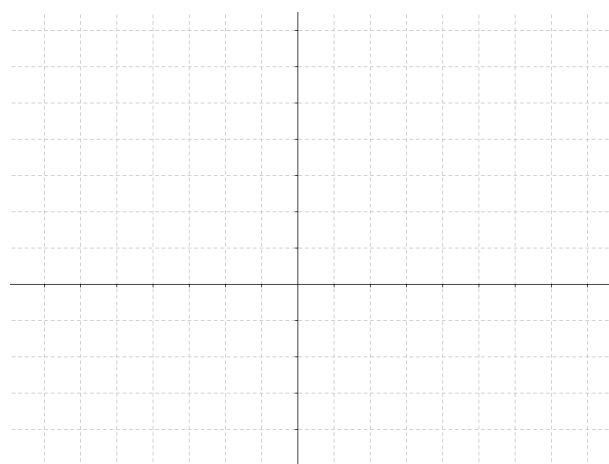
Solve the equation $(x+3)(x+1)=0$. Use the interactive file to check your answers.



12. Draw a rough graph of the function

$$f(x) = (x-1)(x-1).$$

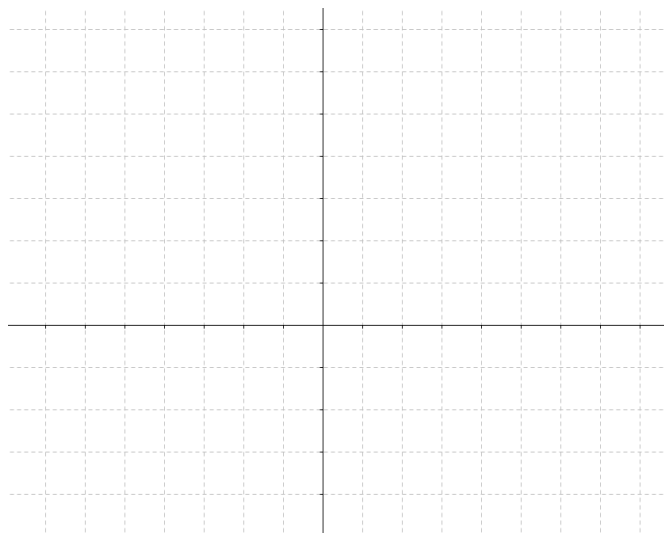
Solve the equation $(x-1)(x-1)=0$. Use the interactive file to check your answers.



13. Draw a rough graph of the function

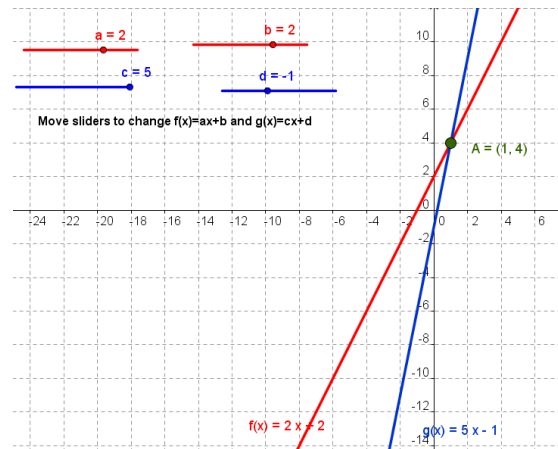
$$f(x) = (x+3)(x-3).$$

Solve the equation $(x+3)(x-3)=0$. Use the interactive file to check your answers.



Student Activity: To investigate equations of the form $ax + b = cx + d$

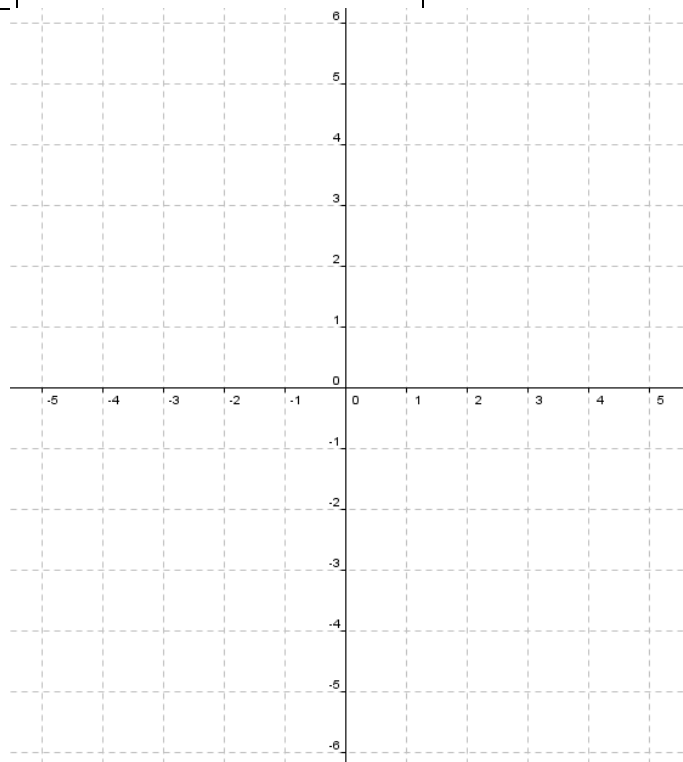
use in connection with the interactive file, 'Simultaneous Equations of First Degree', on the Student's CD.



1.

- a. Complete the following table and on the same axes draw the graphs of the following functions $f(x) = 3x + 1$ and $g(x) = 2x + 1$.

x	$f(x) = 3x + 1$	$g(x) = 2x + 1$
-3		
-2		
-1		
0		
1		
2		



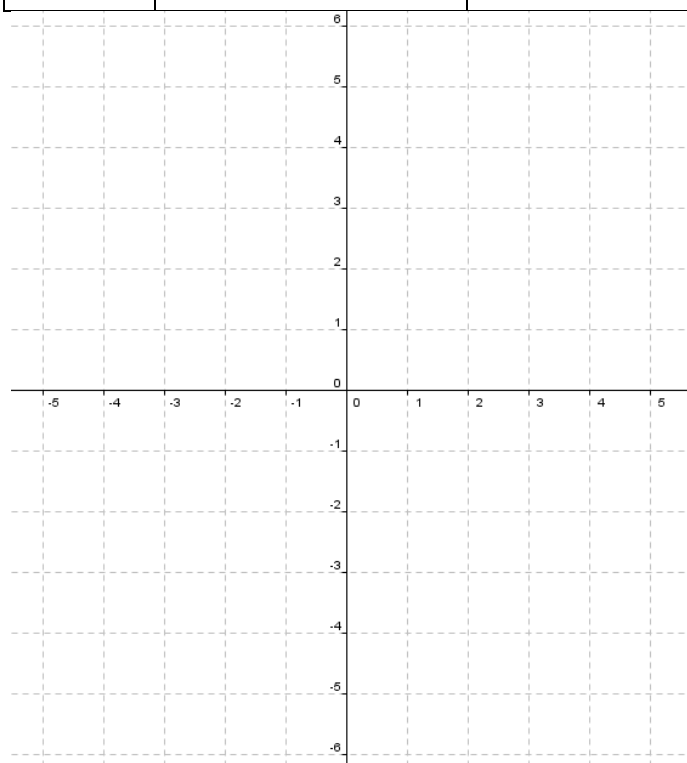
- b. Show on the graph and name the point(s) where $f(x) = 3x + 1$ and $g(x) = 2x + 1$ intersect. What information does this give us?

- c. How many points of intersection do the graphs of $f(x)$ and $g(x)$ have? Could they intersect at other points not visible on your graph? Explain your answer.

2.

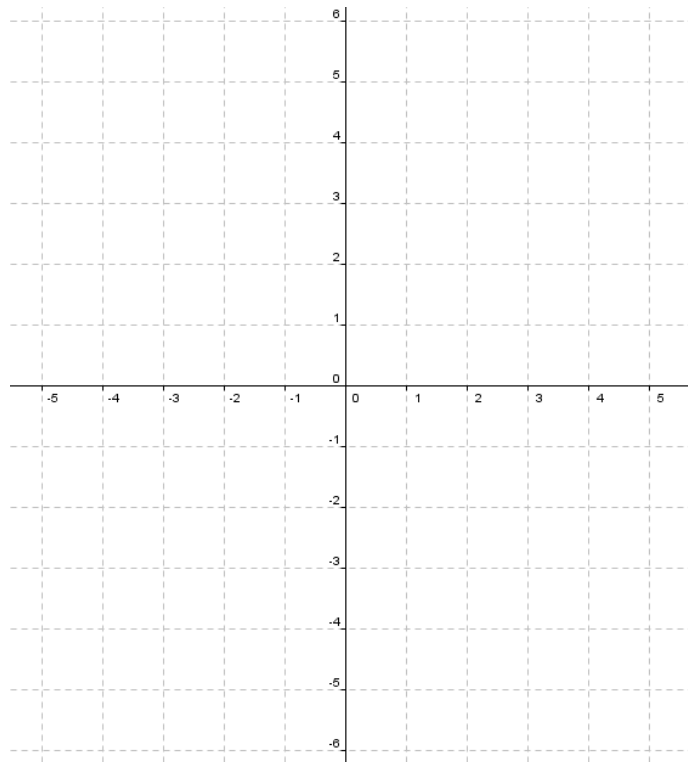
- a. Complete the following table and on the same axes draw the graphs of the following functions $f(x) = 1x + 4$ and $g(x) = 2x + 3$.

x	$f(x) = 1x + 4$	$g(x) = 2x + 3$
-2		
-1		
0		
1		
2		

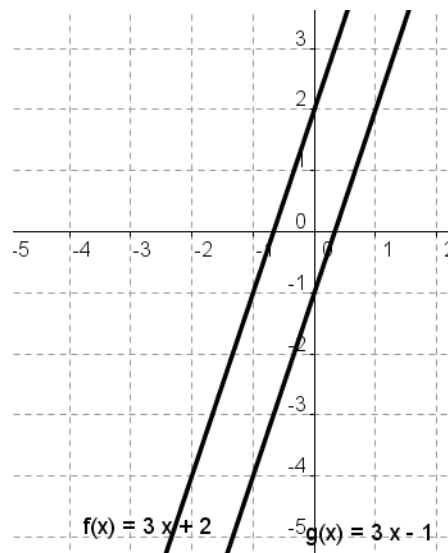


- b. Show on the graph and name the point(s) where $f(x) = 1x + 4$ and $g(x) = 2x + 3$ intersect. What information does this give us? Could they intersect at other points not visible on your graph? Explain your answer.

3. Graphically find the solution to the equation $f(x) = g(x)$, where $f(x) = 2x+2$ and $g(x) = x+3$.



4. Where do the following functions intersect? Give a reason for your answer.



5. List two other functions that will never intersect with the function $f(x) = 4x+2$.

6. Will the function $f(x) = 2x+1$ ever intersect with the function $g(x) = 2x+8$? Explain.

7. If you know two functions never intersect and the equation of one of the equations is $f(x) = 5x+2$ and the other function cuts the x axis at 3, find its equation.

8. Will the functions $f(x) = 2x+4$ and the function $g(x) = -2x+1$ ever intersect each other? Explain your answer.

9. Solve the following either by algebra or graphically and then check using the interactive file:

a. $2x+5 = 4x+1$

b. $3x+2 = 5x$

c. $-4x+4 = 5x-5$

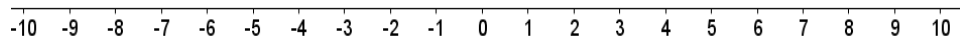
d. $3x+2 = 8$

Student Activity: To investigate simple inequalities

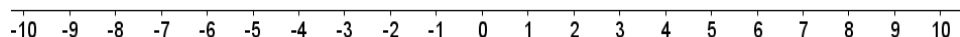
Use in connection with the Interactive file, 'Simple Inequalities', on the Student's CD.

1. Show the following inequalities on the following number line:

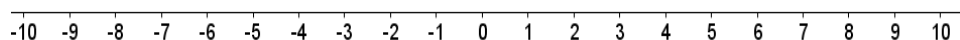
a. $x < 2, x \in \mathbb{R}$.



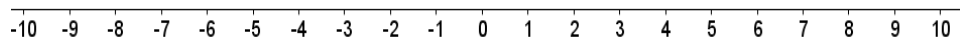
b. $x > 3, x \in \mathbb{R}$.



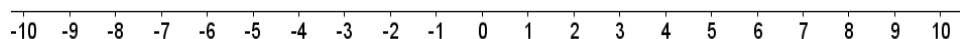
c. $x \leq 4, x \in \mathbb{R}$.



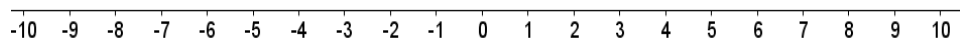
d. $x \geq 5, x \in \mathbb{R}$.



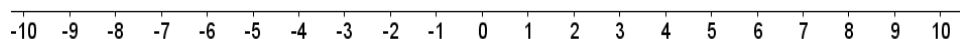
e. $x \leq 2, x \in \mathbb{R}$.



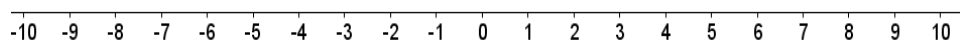
f. $x > 0, x \in \mathbb{R}$.



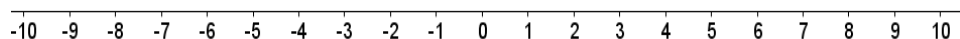
g. $x < 0, x \in \mathbb{R}$.



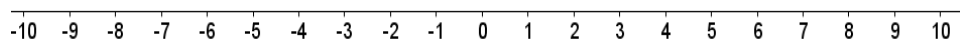
h. $x > -2, x \in \mathbb{R}$.



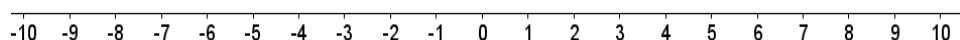
i. $x < -4, x \in \mathbb{R}$.



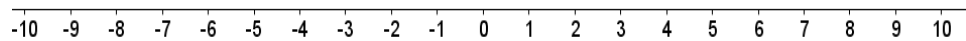
j. $x \geq -2, x \in \mathbb{R}$.



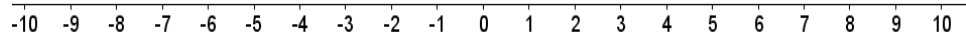
k. $x \leq -1, x \in \mathbb{R}$.



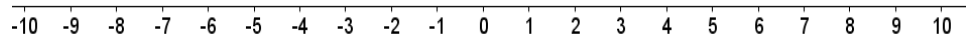
l. $x < 2, x \in \mathbb{Z}$. (Note this is not $x \in \mathbb{R}$.)



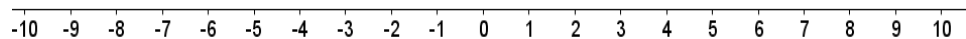
m. $x > 3, x \in \mathbb{N}$. (Note this is not $x \in \mathbb{R}$.)



n. $x \leq 4, x \in \mathbb{N}$. (Note this is not $x \in \mathbb{R}$.)

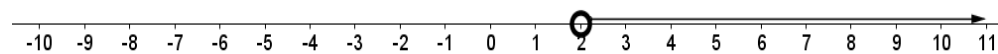


o. $x \geq 5, x \in \mathbb{Z}$. (Note this is not $x \in \mathbb{R}$.)

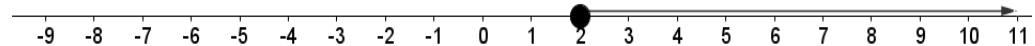


2. Which inequality does each in the following number represented, given $x \in \mathbb{R}$?

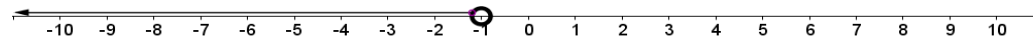
a.



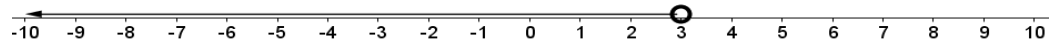
b.



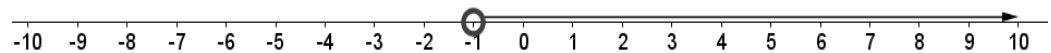
c.



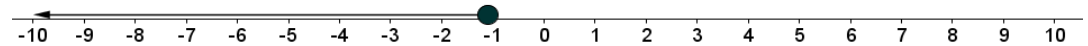
d.



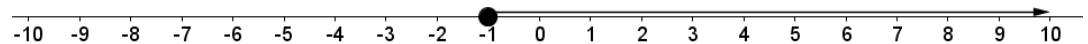
e.



f.



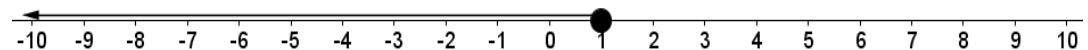
g.



h.



i.



Substitution Quiz 1

1. Find the value of $a + b$ when $a = 2$ and $b = 3$.
A. 7
B. 5
C. 6
D. 1
2. Given $a = 2$, $b = 2$ and $c = 4$. Find the value of $a + c$.
A. 4
B. 8
C. 7
D. 6
3. Find the value of $a + b + c$ given $a = 1$, $b = 3$ and $c = 4$.
A. 8
B. 4
C. 7
D. 12
4. Find the value of ab given $a = 2$ and $b = 3$.
A. 8
B. 5
C. 1
D. 6
5. Given $a = 2$, $b = 3$ and $c = 0$. Find the value of bc .
A. 3
B. 0
C. 6
D. 5
6. Find the value of $2b$ given $b = 3$.
A. 4 B. 5 C. 6 D. 1

7. Given $a = 2$, $b = 3$ and $c = 4$. Find the value of $2(a + b)$.
- A. 7
 - B. 12
 - C. 9
 - D. 10
8. Given $a = 2$ and $c = 1$. Find the value of $3(a + c)$.
- A. 12
 - B. 9
 - C. 8
 - D. 6
9. Find the value of $a(b + c)$ given $a = 2$, $b = 3$ and $c = 1$.
- A. 8
 - B. 5
 - C. 4
 - D. 6
10. Given $a = 0$, $b = 3$ and $c = 4$. Find the value of $a(b + c)$.
- A. 8
 - B. 7
 - C. 1
 - D. 0
11. Find the value of $2(a + c)$ when $a = 1$, $b = 2$ and $c = 3$.
- A. 4
 - B. 8
 - C. 6
 - D. 9
12. Given $a = 2$, $b = 3$ and $c = 4$. Find the value of $3ab$.
- A. 24
 - B. 8
 - C. 15
 - D. 18

13. Given $a = 3$. Find the value of a^2 .
- A. 4
 - B. 5
 - C. 6
 - D. 9
14. Given $a = 2$. Find the value of $2a^2$.
- A. 6
 - B. 8
 - C. 16
 - D. 4
15. Given $a = 2$, $b = 3$ and $c = 4$. Find the value of $a^2 + b^2$.
- A. 12
 - B. 13
 - C. 10
 - D. 25
16. Given $a = 2$, $b = 3$ and $c = 1$. Find the value of $2a^2 + 3b$.
- A. 11
 - B. 17
 - C. 5
 - D. 8
17. Given $a = 2$ and $b = 1$. Find the value of $a^2 + b$.
- A. 5
 - B. 9
 - C. 3
 - D. 4
18. Given $a = 2$. Find the value of $3a^2 + 2$.
- A. 8
 - B. 14
 - C. 12
 - D. 6

19. Given $a = 1$. Find the value of $a^2 + 3a + 1$.

A. 9

B. 5

C. 6

D. 1

20. Given $a = 3$. Find the value of $1/a^2$.

A. $1/3$

B. $1/9$

C. 9

D. 6

Substitution Quiz 2

1. Find the value of $a + b$ when $a = 3$ and $b = -2$.
 - A. -1
 - B. -5
 - C. 6
 - D. 1
2. Given $a = 2$ and $c = -4$. Find the value of $a + c$.
 - A. -6
 - B. -2
 - C. 2
 - D. 6
3. Find the value of $a + b + c$ given $a = 1$, $b = 3$ and $c = -4$.
 - A. 0
 - B. 4
 - C. 7
 - D. 8
4. Find the value of ab given $a = -2$ and $b = -3$.
 - A. -5
 - B. -6
 - C. 6
 - D. 5
5. Find the value of ab given $a = 2$ and $b = -3$.
 - A. 8
 - B. -1
 - C. 6
 - D. -6
6. Given $a = 5$ and $c = 0$. Find the value of ac .
 - A. 3
 - B. 0

- C. 6
- D. 1
7. Find the value of $2b$ given $b = -3$.
- A. 6
- B. 5
- C. -6
- D. -1
8. Given $a = -2$ and $b = 3$. Find the value of $2(a + b)$.
- A. 7
- B. 2
- C. 9
- D. -1
9. Given $a = 2$ and $c = -1$. Find the value of $3(a + c)$.
- A. 12
- B. 3
- C. 8
- D. -6
10. Find the value of $a(b + c)$ given $a = -2$, $b = -3$ and $c = 1$.
- A. 4
- B. 5
- C. -4
- D. 6
11. Given $a = 0$, $b = -3$ and $c = -4$. Find the value of $a(b + c)$.
- A. 0
- B. 7
- C. 1
- D. -1
12. Given $a = 1$, $b = -3$ and $c = -4$. Find the value of $a(b - c)$.
- A. -1

- B. 7
- C. -8
- D. 1

13. Find the value of $2(a + c)$ when $a = -1$ and $c = -3$.

- A. 4
- B. -8
- C. 6
- D. 8

14. Given $a = -2$, $b = -3$ and $c = 4$. Find the value of $3ab$.

- A. 18
- B. 8
- C. 10
- D. 9

15. Given $a = -3$. Find the value of a^2 .

- A. 4
- B. 9
- C. 6
- D. -6

16. Given $a = -2$. Find the value of $2a^2$.

- A. 6
- B. 8
- C. 16
- D. -6

17. Given $a = 2$. Find the value of $-2a^2$.

- A. 6
- B. -8
- C. 16
- D. 8

18. Given $a = -2$. Find the value of $-2a^2$.
- A. 6
 - B. -6
 - C. 8
 - D. -8
19. Given $a = -2$, $b = -3$ and $c = 4$. Find the value of $a^2 + b^2$.
- A. 12
 - B. -13
 - C. 13
 - D. 25
20. Given $a = -2$, $b = -3$ and $c = 4$. Find the value of $a^2 - b^2$.
- A. 12
 - B. -5
 - C. -13
 - D. 1
21. Given $a = -2$, $b = -3$ and $c = 4$. Find the value of $2a^2 + 3b$.
- A. 11
 - B. -1
 - C. 5
 - D. -10
22. Given $a = -2$ and $b = -1$. Find the value of $a^2 + b$.
- A. 3
 - B. 9
 - C. -9
 - D. -3

23. Given $a = -2$. Find the value of $3a^2 - 2$.
- A. 8
 - B. 24
 - C. 12
 - D. 10
24. Given $a = -1$. Find the value of $a^2 + 3a + 1$.
- A. 9
 - B. -1
 - C. 6
 - D. 5
25. Given $a = -1$. Find the value of $a^2 - 3a + 1$.
- A. 9
 - B. 6
 - C. 5
 - D. -1
26. Given $a = -3$. Find the value of $1/a^2$.
- A. $1/3$
 - B. $1/9$
 - C. 6
 - D. 9

Factors Quiz

1. In the following expression, $3a + 7ab + 6a(b + c)$ how many terms are there?
 - A. 9
 - B. 3
 - C. 4
2. Are the factors of an expression, the expressions that divide evenly into the original expression?
 - A. True
 - B. False
3. What are the factors of $2a^2 + 4$?
 - A. $2(a^2 + 4)$
 - B. $2(a^2 + 2)$
4. What are the factors of $4a + 28ab$?
 - A. $4a(7b)$
 - B. $4a(1 + 7b)$
 - C. $4a(1 + 28b)$
5. What are the factors of $3x + 9y$?
 - A. $3(x + 3y)$
 - B. $3(x + 9y)$
 - C. $3x(1 + 9y)$
6. What are the factors of $x^2 + x$?
 - A. $x(x^2 + x)$
 - B. $x(x^2 + x)$
 - C. $x(x + x)$

7. What are the factors of $2x^2+4x$?
 - A. $2x(x+2)$
 - B. $2x(x+4)$
 - C. $2x(x+4x)$

8. What are the factors of $9a^2+18b$?
 - A. $9ab(a+2)$
 - B. $9a(a+2)$
 - C. $9(a^2+2b)$

9. What are the factors of $27a^2+18a$?
 - A. $9a(3a+2)$
 - B. $9a(3+2)$

10. What are the factors of $8x^2+16y^2$?
 - A. $8(x^2+y^2)$
 - B. $8(x^2+2y^2)$
 - C. $8(x^2+16y^2)$

11. What are the factors of $x^4+x^3+x^2+x$?
 - A. $x(4x)$
 - B. $x(x^3+x^2+x)$
 - C. $x(x^3+x^2+x+1)$

12. What are the factors of $x^4+3x^3+6x^2+7x$?
 - A. $x(x^4+3x^3+6x^2+7x)$
 - B. $x(x^3+3x^2+6x+7)$
 - C. $x(3x^3+6x^2+7x)$

13. What are the factors of $6x^4 + 4x^3 + 2x^2 + 8x$?
 - A. $2x(3x^3 + 2x^2 + 2x)$
 - B. $2x(6x^4 + 4x^3 + 2x^2 + 8x)$
 - C. $2x(3x^3 + 2x^2 + x + 4)$

14. What are the factors of $x^2y + xy + xy^2$?
 - A. $xy(x+y)$
 - B. $xy(x+1+y)$
 - C. There are no factors.

15. What are the factors of $x^2y + 2xy$?
 - A. $xy(x+2)$
 - B. $3xy$
 - C. $xy(xy+2)$

16. What are the factors of $x^2y - 2xy$?
 - A. $xy(xy - 2)$
 - B. $3xy$
 - C. $xy(x - 2)$

17. What are the factors of $16a^2b^2 - 4abc$?
 - A. $4abc(4b - 1)$
 - B. $4ab(4b - 4)$
 - C. $4ab(4ab - c)$

18. What are the factors of $36a^2 - 27b^2 + 42c^2$?
 - A. $3abc(12a - 9b + 14c)$
 - B. $3(12a^2 - 9b^2 + 14c^2)$
 - C. $3a(12a - 9b + 14c)$

19. What are the factors of $st+tr+st^2r$?
- A. $t(s+r+str)$
 - B. $str(s+r+str)$
 - C. $t(s+r+sr)$
20. What are the factors of $(2x^2+3x)+5x$?
- A. $2x(x+4)$
 - B. $2x(x+8)$
 - C. $2x(x+8x)$
21. What are the factors of $8x+16x^2+4x^3$?
- A. $4x(2+4x)+4x^3$
 - B. $4x(2+16x+4x^2)$
 - C. $4x(2+4x+x^2)$

Difference of Two Squares Quiz

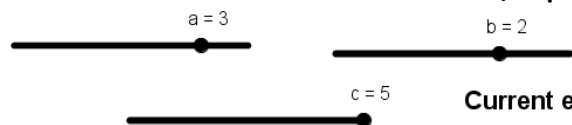
1. What are the factors of $x^2 - y^2$?
 - A. $(x+y)(x-y)$
 - B. $(x-y)(x-y)$
 - C. $(x+y)(x+y)$
2. What are the factors of $a^2 - b^2$?
 - A. $(a-b)(a-b)$
 - B. $(a-b)(a+b)$
 - C. $(a-b)(b+a)$
3. What are the factors of $x^2 - 9$?
 - A. $(x-9)(x-9)$
 - B. $(x-3)(x+3)$
 - C. $(x-3)(x-3)$
4. What are the factors of $5^2 - y^2$?
 - A. $(5-y)(5+y)$
 - B. $(y-5)(y-5)$
 - C. $(5-y)(5-y)$
5. What are the factors of $25(x^2 - 9)$?
 - A. $25(x+3)(x-3)$
 - B. $25(x-9)(x-9)$
 - C. $5(x-9)(x-9)$
6. What are the factors of $81-16y^2$?
 - A. $(81+16y)(81-16y)$
 - B. $(9+4y)(9-4y)$
 - C. $(81+4y)(81-4y)$

7. What are the factors of $-25 + y^2$?
 - A. $(y+5)(y-5)$
 - B. $(y+25)(y-25)$
 - C. $(-5-y)(-5+y)$
8. What are the factors of $x^2y^2 - 9$?
 - A. $(xy+9)(xy-9)$
 - B. $(xy+3)(xy-3)$
 - C. $x^2(y+3)(y-3)$
9. What is the result of $(x+\sqrt{2})(x-\sqrt{2})$?
 - A. $x^2 - 2\sqrt{2}x + 2$
 - B. x^2
 - C. $x^2 - 2$
10. Find the factors of $x^2 - 5$.
 - A. $(x+\sqrt{5})(x-\sqrt{5})$
 - B. $(x+5)(x-5)$
11. What are the factors of $81d^2 - 25c^2$?
 - A. $81(d+5c)(d-5c)$
 - B. $(9d+5c)(9d-5c)$
 - C. $\frac{81}{25}(d+c)(d-c)$
12. What are the factors of $x^4 - y^4$?
 - A. $(x^2+y^2)(x+y)(x-y)$
 - B. $(x^2+y^2)(x+y)(x+y)$
13. What are the factors of $(d-2)^2 - 9$?
 - A. $(d+1)(d-1)$
 - B. $(d+3)(d-3)$

- C. $(d+1)(d-5)$
14. What are the factors of $-121+16m^2$?
- A. $(4m+11)(4m-11)$
- B. $(4m-11)(4m-11)$
- C. $(-11+4m)(-11-4m)$
15. What are the factors of $28x^2-63y^2$?
- A. $\frac{28}{63}(x+y)(x-y)$
- B. $7(2x+3y)(2x-3y)$
- C. $7(2x+9y)(2x-9y)$
16. What are the factors of $25-(c+2)^2$?
- A. $(7+c)(3-c)$
- B. $(5+c)(5-c)$
- C. $(3+c)(3-c)$
17. What are the factors of y^6-36 ?
- A. $y^5(y+3)(y-3)$
- B. $(y^3+6)(y^3-6)$
- C. There are no factors.
18. What are the factors of y^4-144 ?
- A. $(y^2+12)(y^2-12)$
- B. $(y^4+12)(y^4-12)$
- C. $(y^2+12)(y+12)(y-12)$
19. Calculate $(101)^2-(99)^2$?
- A. 200 B. 9999 C. 400
20. Calculate $(99)^2-(101)^2$?
- A. -400 B. 400 C. 4

Student Activity: To solve equations of the form $ax + b = c$

Use in connection with the Interactive file, 'Equation $ax + b = c$ ', on the Student's CD.



Current equation is $3x + 2 = 5$

Move sliders to form equation $ax + b = c$

$$3x + 2 + (-2) = 5 + (-2)$$

$$3x = 3$$

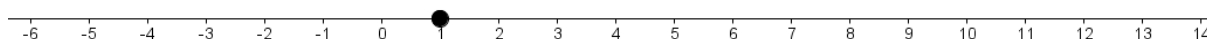
Divide both sides by 3 $x = 1$

☒ Click to see step1

☒ Click to see step 2

☒ Click to see step 3

☒ Click to see point on the number line



$$3(1) + 2 = 5$$

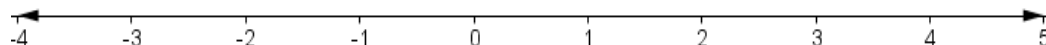
$$5 = 5$$

☒ Click to check solution

6. Using algebra **solve** the following equations where $x \in \mathbb{Z}$, **show your solution on the number line** provided and **check solution**:

a.

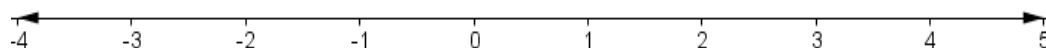
	Action to the left hand side of the equation.	$2x + 3 = 7$	Action to the right hand side of the equation.
Step 1			
Step 2			
Step 3			



Check solution.

b.

	Action to the left hand side of the equation.	$3x - 3 = 9$	Action to the right hand side of the equation.
Step 1			
Step 2			
Step 3			



Check solution.

c.

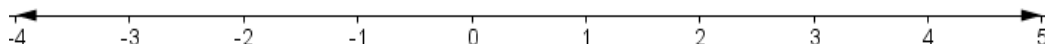
	Action to the left hand side of the equation.	$4x + 5 = 17$	Action to the right hand side of the equation.
Step 1			
Step 2			
Step 3			



Check solution.

d.

	Action to the left hand side of the equation.	$4x - 5 = 19$	Action to the right hand side of the equation.
Step 1			
Step 2			
Step 3			

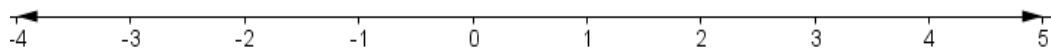


Check solution.

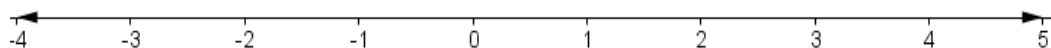
7. What do you notice about the action on the left hand side and the action on the right hand side when solving the equations in number 1 above?

8. Solve the following equations using algebra where $x \in \mathbb{Z}$, show your solution on the number line provided and check solution:

- a. $4x - 5 = 27$



b. $4(x+2)=16$



c. $-3(x+2) = 9$



9. When solving the equation $3x + 4 = 10$ $x \in \mathbb{Z}$:

a. Why do you add -4 to each side?

b. Why do you then divide by 3?

c. Why is the order of these operations important?

10. Brendan thinks of a number then adds 3. The total now equals 15. Represented this as an equation? Solve the equation and check your solution.

11. Joanne thinks of a number then subtracts 5 and the result is 10. Show how this can be represented as an equation? Solve the equation and check your solution.

12. A farmer has a number of cows and he plans to double that number next year, so that he will then have 24. Write an equation to represent this. Solve the equation and check your solution.

13. A new student enters a class and the class now has 25 students. Let x represent the number of students that were in the class at first. Write this as an equation. Solve the equation and check your solution.

14. Martha has a certain number of sweets in a bag and she gives half of them to John. If John receives 20, show how this can be represented as an equation? Solve the equation and check your solution.

15. The temperature increases by 18 degrees and the temperature is now 15. Show how this can be represented as an equation? Solve the equation and check your solution.

16. A farmer doubles the amount of cows he has and then buys 3 more, he now has 29. Represent this as an equation and solve this equation. How many cows did he originally have?

Student Activity: To solve equations of the form $ax + b = cx + d$

Use in connection with the Interactive file, 'Equation $ax + b = cx + d$ ', on the Student's CD.

Move sliders to form an equation of the form $ax + b = cx + d$

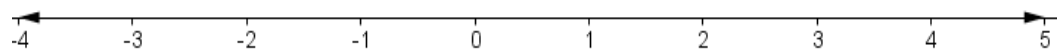
$a = 1$
 $b = 4$
 $c = -2$
 $d = -5$

☒ Click to show equation $1x + (4) = -2x + (-5)$
☒ Click to see step 1 $1x + (4) + (-4) = -2x + (-5) + (-4)$
☒ Click for step 2 $1x = -2x + (-9)$
☒ Click to see step 3 $1x + (2x) = -2x + (2x) + (-9)$
☒ Click to see step 4 $3x = -9$ Divide both sides by 3
☒ Click for step 5 $x = -3$
☒ Click to show solution on number line
☒ Click to check solution $1(-3) + 4 = -2(-3) + -5$
 $1 = 1$

1. Using algebra solve the following equations, show your solution on the number line provided and check solution:

a.

	Action to the left hand side of the equation.	$2x + 3 = x + 7$	Action to the right hand side of the equation.
Step 1			
Step 2			
Step 3			
Step 4			
Step 5			



Check solution.

b.

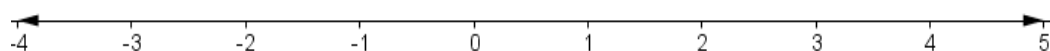
	Action to the left hand side of the equation.	$2x + 2 = 4x - 6$	Action to the right hand side of the equation.
Step 1			
Step 2			
Step 3			
Step 4			
Step 5			



Check solution.

c.

	Action to the left hand side of the equation.	$3x - 3 = 2x + 8$	Action to the right hand side of the equation.
Step 1			
Step 2			
Step 3			
Step 4			
Step 5			



Check solution.

d.

	Action to the left hand side of the equation.	$3x - 8 = 4x - 5$	Action to the right hand side of the equation.
Step 1			
Step 2			
Step 3			
Step 4			
Step 5			

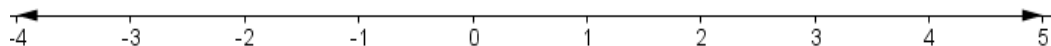


Check solution.

2. If you are checking your solution, and you find that the left hand side is not equal to the right hand side, what does this mean and what should you now do?

3. Solve the following equations using algebra, show your solution on the number line provided and check your solution:

a. $3x - 6 = -2x + 9$



Check solution.

b. $4x + 4 = 2x + 5$



Check solution.

c. $-3(x + 2) + 5 = x + 3$



Check solution.

4. A number is doubled and then three is added to it. This number is now equal to four times the original number minus seven. Show how this can be represented as an equation? Solve the equation and check your answer.

5. A farmer has a number of sheep and he buys three more. He then doubles this number of sheep and discovers he has five times the original number less three.

6. A woman is four times as old as her daughter was two years ago. The sum of their current ages is 52. Use an equation to find their present ages.

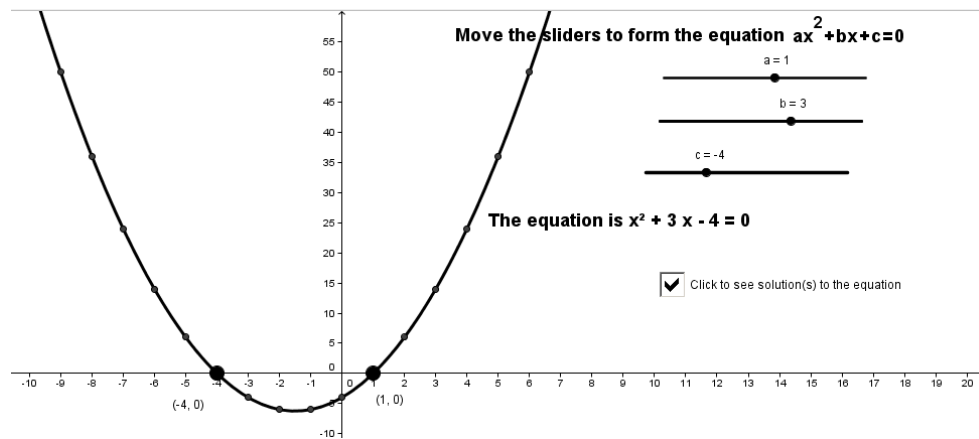
7. The sum of three consecutive numbers is 18. Use an equation to find what the numbers are.

8. Samantha had €40. After buying five CD's of the same value in a sale, she has €6 left. Represent this situation as an equation and solve the equation to find the cost of a CD.

Student Activity: To investigate quadratics of the form

$$f(x) = ax^2 + bx + c$$

Use in connection with the interactive file, 'Quadratic', on the student's CD.

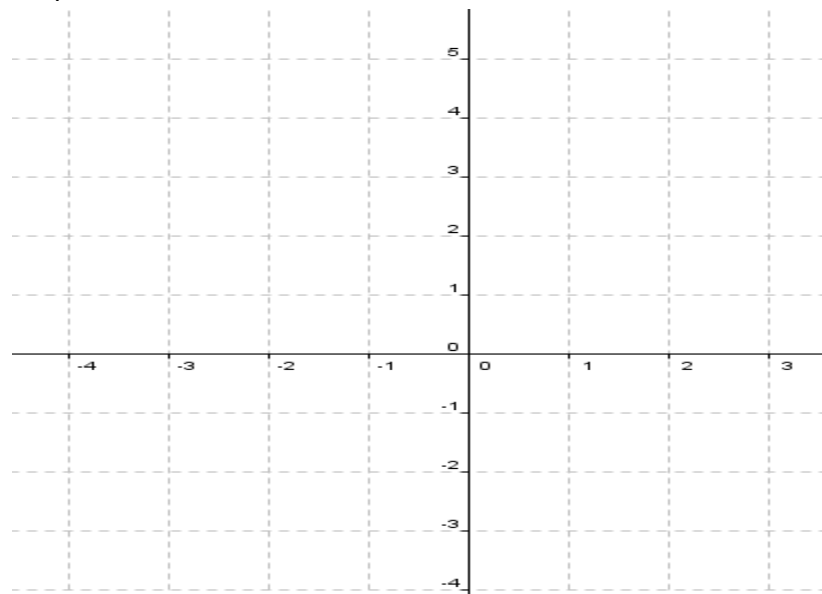


1)

a) Complete the following table:

x	x^2	$2x$	-3	$y=f(x)=x^2+2x-3$
-4			-3	
-3				
-2				
-1				
0				
1				
2				

b) Draw the graph represented in the above table.



c) Where does the graph intersect the x axis?

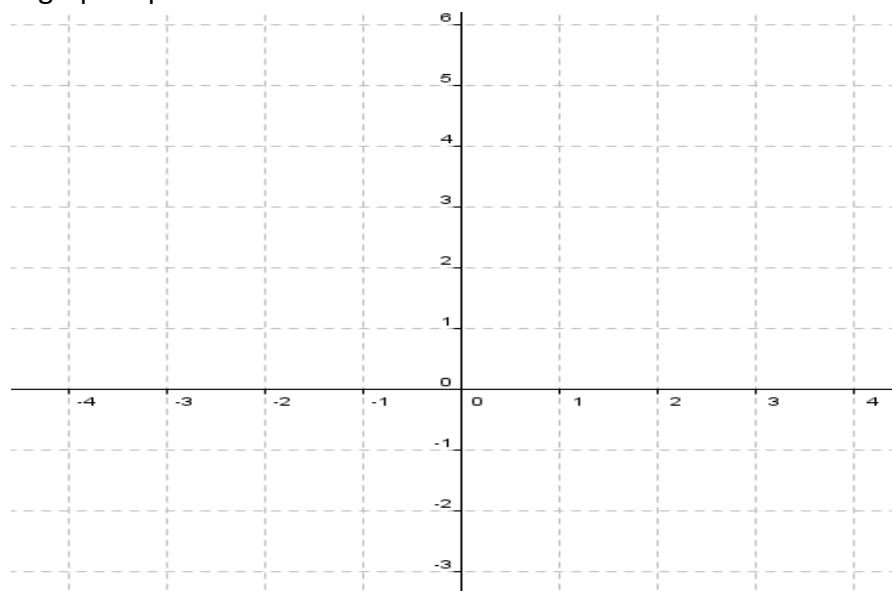
d) What is the value of $f(x)$ at the points where the graph intersects the x axis?

e) Given that the solution(s) of an equation are the points where the graph of the equation cuts the x axis, what is the solution of $x^2+2x-3=0$?

2) Complete the following table:

x	x^2	x	-2	$y = x^2+x-2$
-3				
-2				
-1				
-0.5				
0				
1				
2				

a) Draw the graph represented in the above table.



b) Where does the graph intersect the x axis?

c) What is the value of $f(x)$ at the points where the graph cuts the x axis?

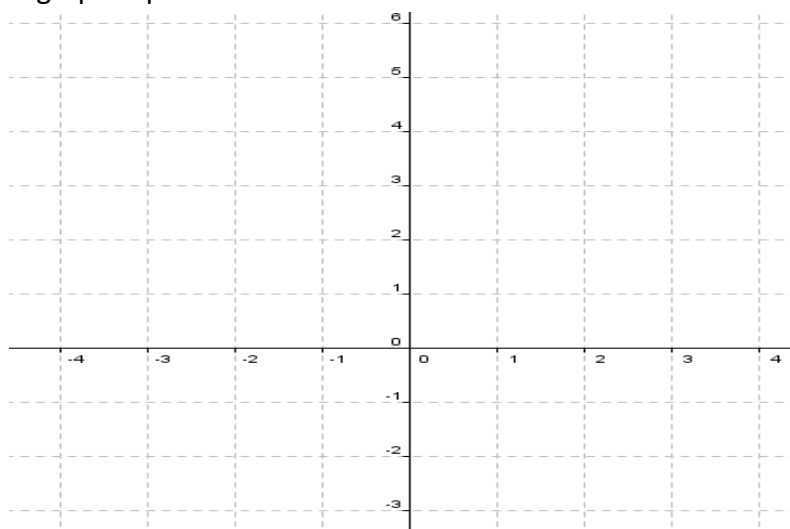
d) What is the solution(s) of $x^2+2x-2=0$.

3)

a) Complete the following table:

x	x^2	x	1	$y = x^2 + 2x + 1$
-3				
-2				
-1				
-0.5				
0				
1				
2				

b) Draw the graph represented in the above table.



c) Where does the graph intersect the x axis?

d) What is the value of $f(x)$ at the points where the graph cuts the x axis?

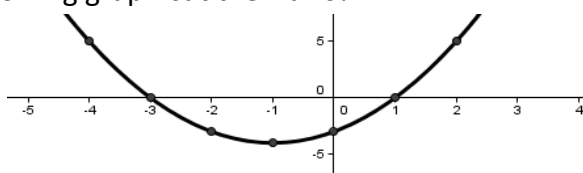
e) What is the solution of $x^2 + 2x + 1 = 0$.

4) Using the interactive file determine what happens to the shape of the graph when $a=0$.

5) Using the interactive file determine what happens to the shape of the graph when a equals minus one.

6)

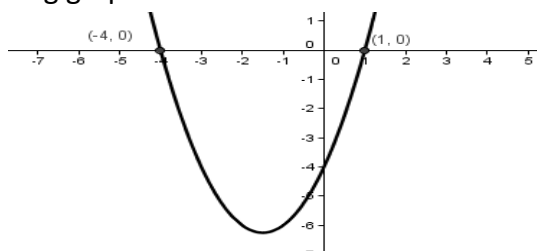
a) Where does the following graph cut the x axis?



- b) Write the equation in the form $(x-m)(x-n)=0$, where m and n are the x co-ordinates of the points where the graph cuts the x axis. Write the equation in the form $ax^2+bx+c=0$. Check the shape of this graph using the interactive file.
-

7)

- a) Where does the following graph cut the x axis?



- b) Write the equation in the form $(x-p)(x-q)=0$, where p and q are the x co-ordinates of the points where the graph cuts the x axis. Write the equation in the form $ax^2+bx+c=0$. Check the shape of this graph using the interactive file.
-

- 8) Using the interactive file, what happens to the graph as a increases in value where a is greater than zero?
-

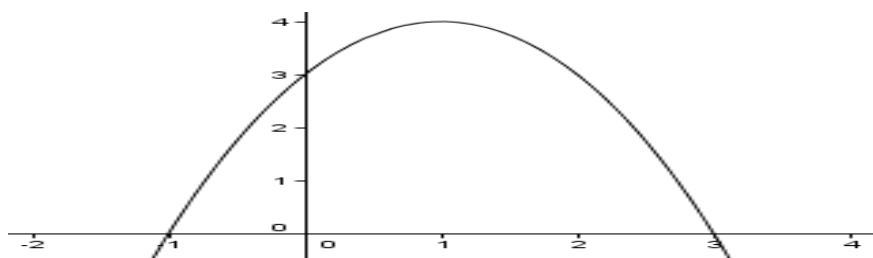
- 9) Using the interactive file, what happens to the graph as a decreases in value where a is greater than zero?
-

- 10) Using the interactive file, what happens to the graph when a is less than zero?
-

- 11) Using the interactive file, what happens to the graph as c increases in value?
-

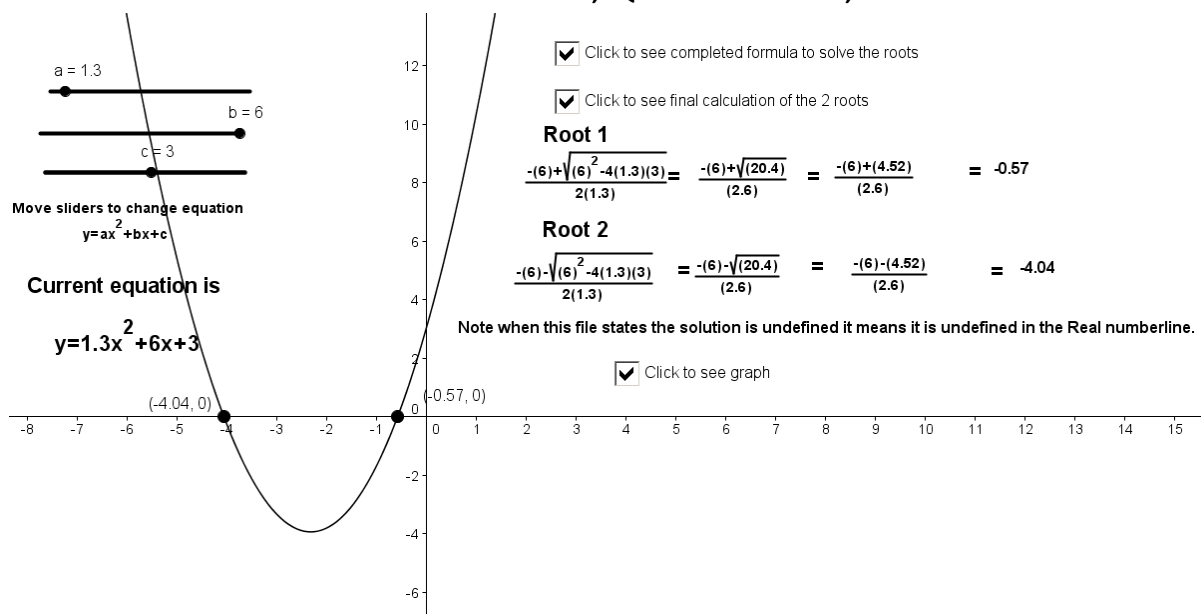
- 12) Using the interactive file, what happens to the graph as c decreases in value?
-

- 13) Will the equation of this graph have the format $ax^2+bx+c=0$ or $-ax^2+bx+c=0$ where a is greater than zero?



Student Activity: To solve a quadratic equation using the formula

Use in connection with the Interactive file, 'Quadratic formula', on the Student's CD.



1.

- a. Given that the equation $1x^2 + 5x + 4 = 0$ is in the form $ax^2 + bx + c = 0$, what values have a, b and c?

- b. By substituting into the formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ solve the above equation for x.

- c. Use the interactive file to determine, where the graph of the function represented by the equation $y = 1x^2 + 5x + 4$ intersects the x axis.

- d. Is there any relationship between the solution(s) to the equation and where the graph of the function represented by the equation intersects the x axis?

- e. What is the name given to equations of the form $ax^2 + bx + c = 0$?

2. Use the formula $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ to solve the following equations given in the form $ax^2 + bx + c = 0$:

a. $x^2 + 6x + 9 = 0$

b. $x^2 + 1x - 2 = 0$

c. $x^2 - 6x + 8 = 0$

d. $-x^2 + 3x + 5 = 0$ (Note it is not possible to check this on the interactive file.)

e. $2x^2 + 3x - 5 = 0$

3. Given the solution to an equation of the form $ax^2+bx+c=0$ is $x = \frac{-2 \pm \sqrt{2^2 - 4(1)(-8)}}{2(1)}$

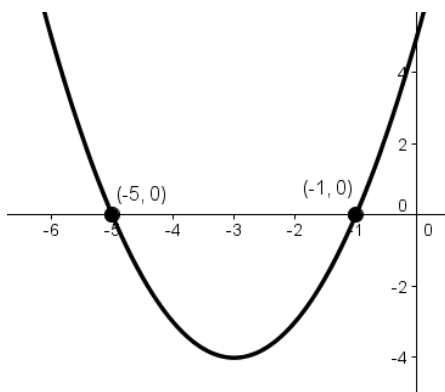
Find a, b and c and hence write down the equation.

4.

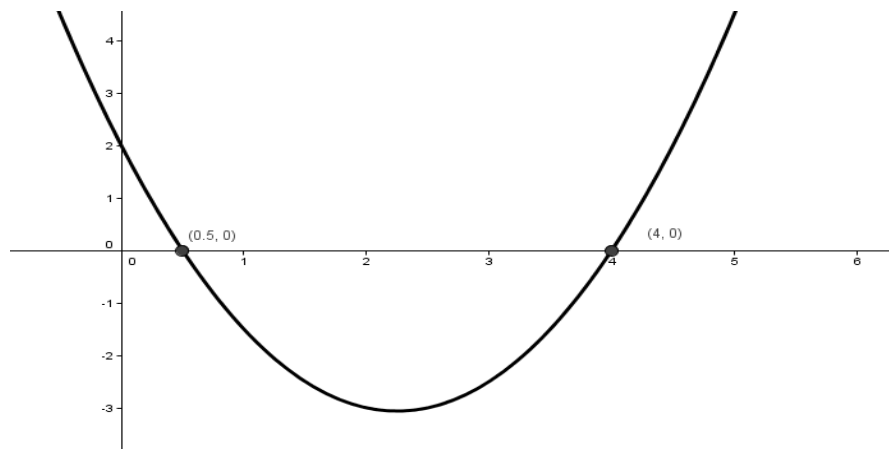
- a. Using the interactive file explain how the graph shows that the equation $x^2 + 3x + 3 = 0$ has no real roots.

- b. Use the formula to solve $x^2 + 3x + 3 = 0$ and state why it is impossible to solve the equation algebraically for $x \in \mathbb{R}$.

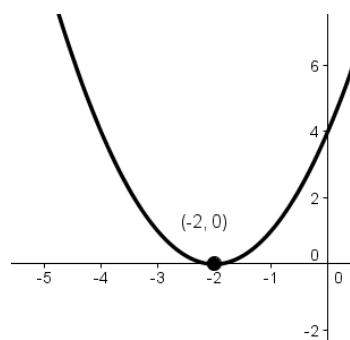
5. What is/are the solution(s) of the equation $x^2+bx+c=0$ represented by the graph below?



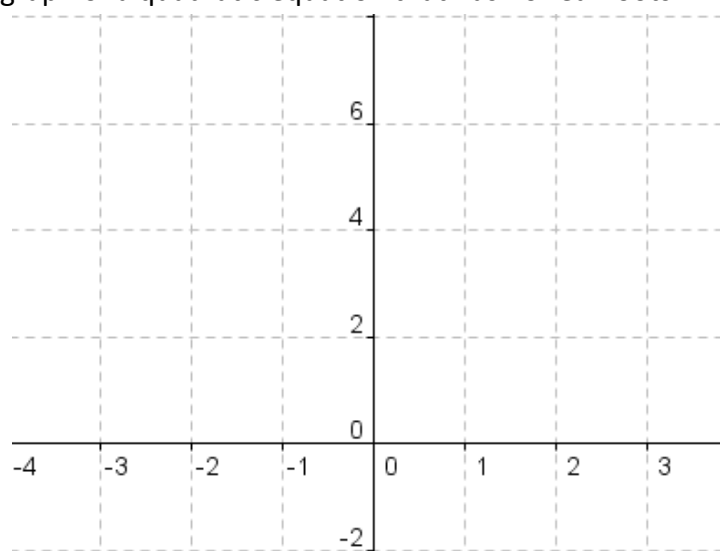
6. What is/are the solution(s) of the equation $x^2+bx+c=0$ represented by the graph below?



7. What is/are the solution(s) of the equation $x^2+bx+c=0$ represented by the graph below?



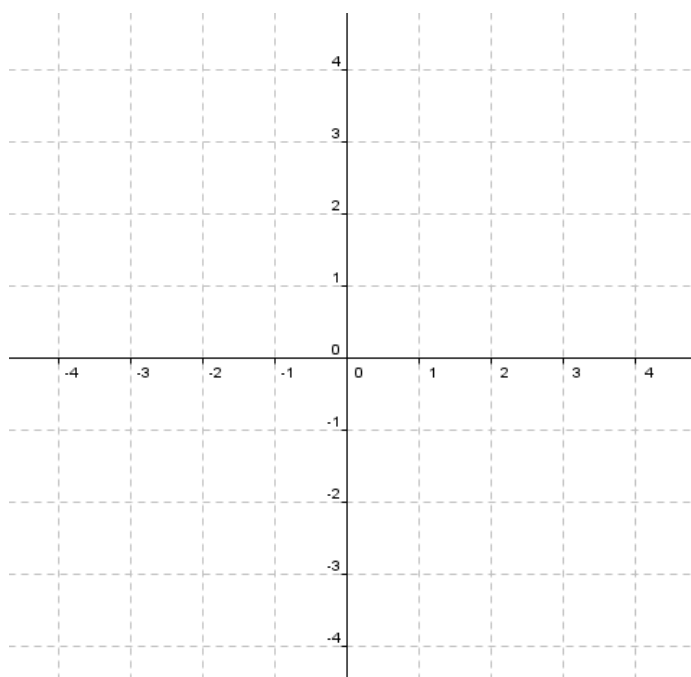
8. Draw a rough graph of a quadratic equation that has no real roots.



9. Explain in your own words what is meant by the solution of a quadratic equation $x^2+bx+c=0$.

10. Solve the equation $x^2 + 4x + 1 = 0$ by formula and then solve the same equation by table and graph (Approximate solutions).

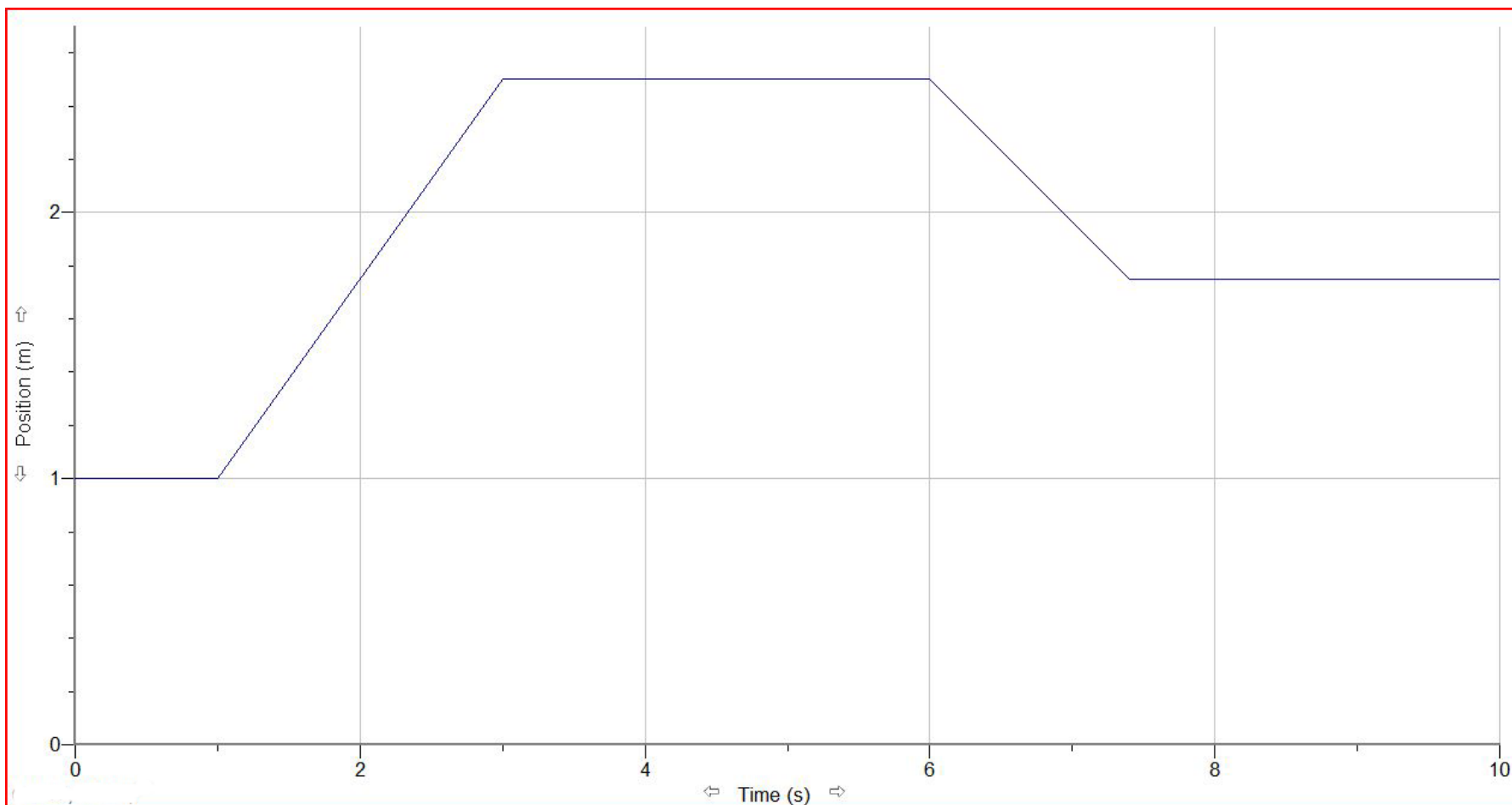
x	$f(x) = x^2 + 4x + 1$	$y = x^2 + 4x + 1$
-4		
-3		
-2		
-1		
0		
1		



11. Will your graphical solution and your algebraic solution always agree? Discuss.

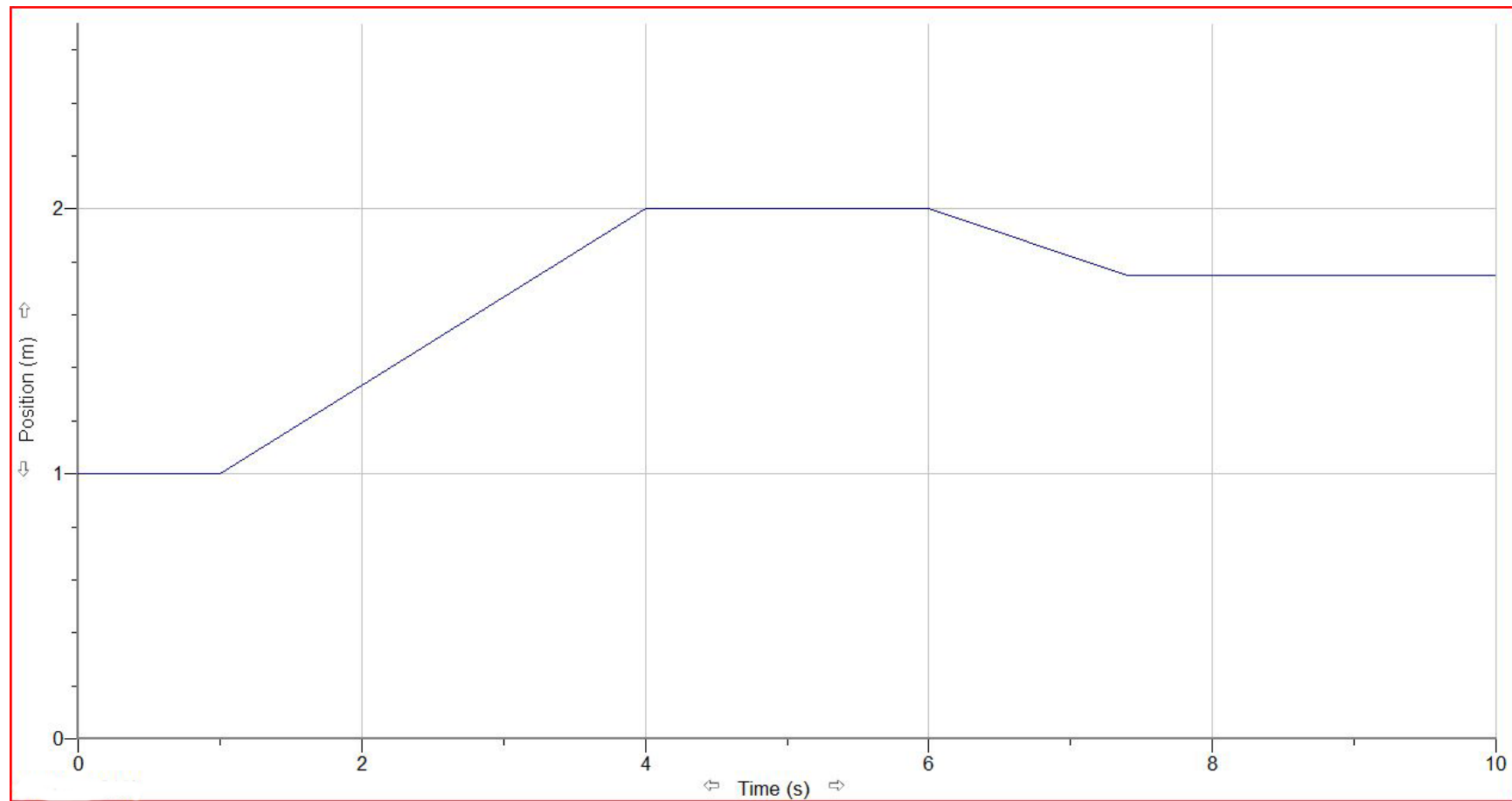
Graph Matching Exercise Graph 1

In the graph provided below, explain what is happening in each section of the graph. You should include the time taken, and state if the distance from the object has increased, decreased or stays the same.



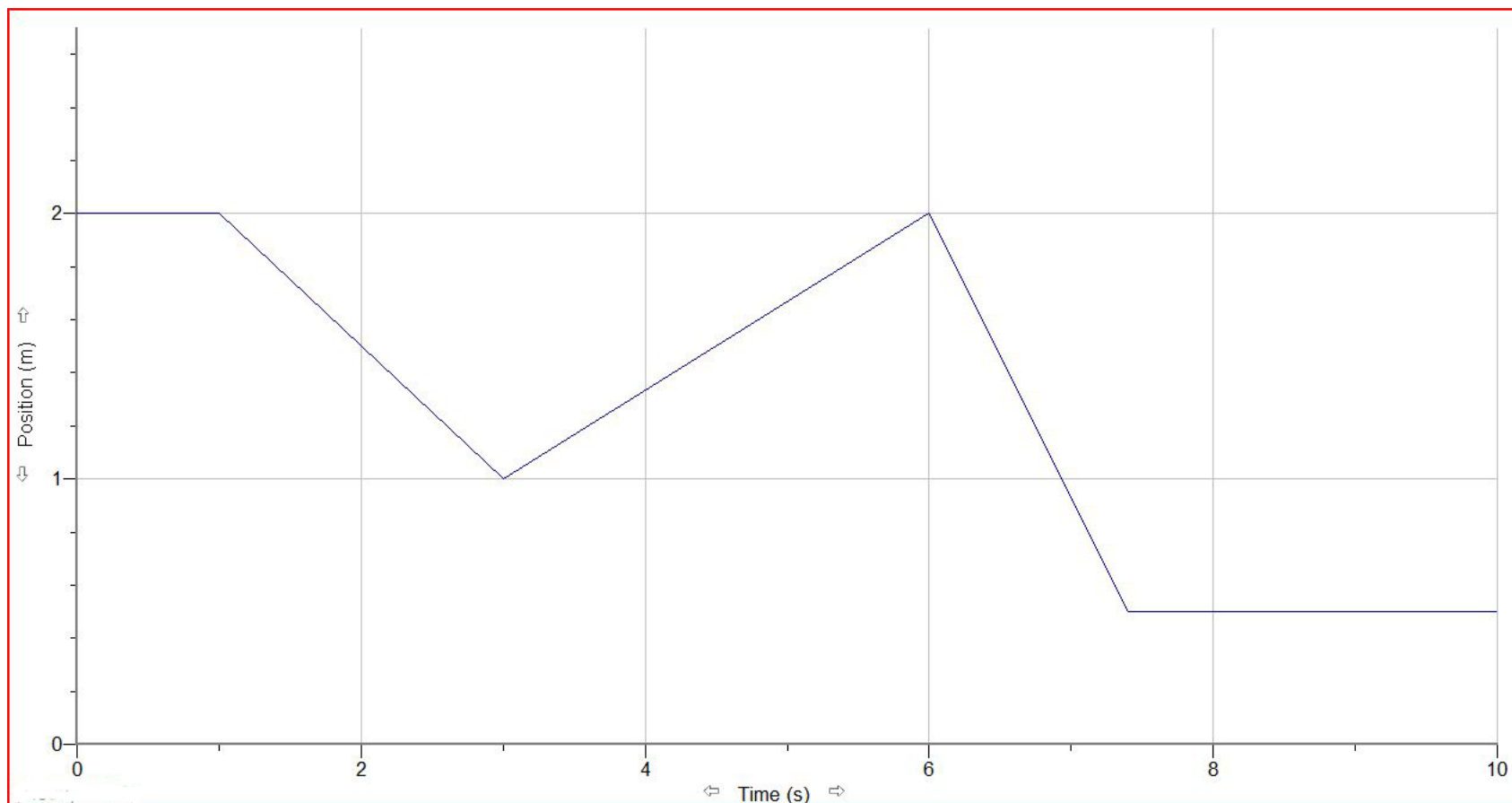
Graph Matching Exercise Graph 2

In the graph provided below, explain what is happening in each section of the graph. You should include the time taken, and state if the distance from the object has increased, decreased or stays the same.



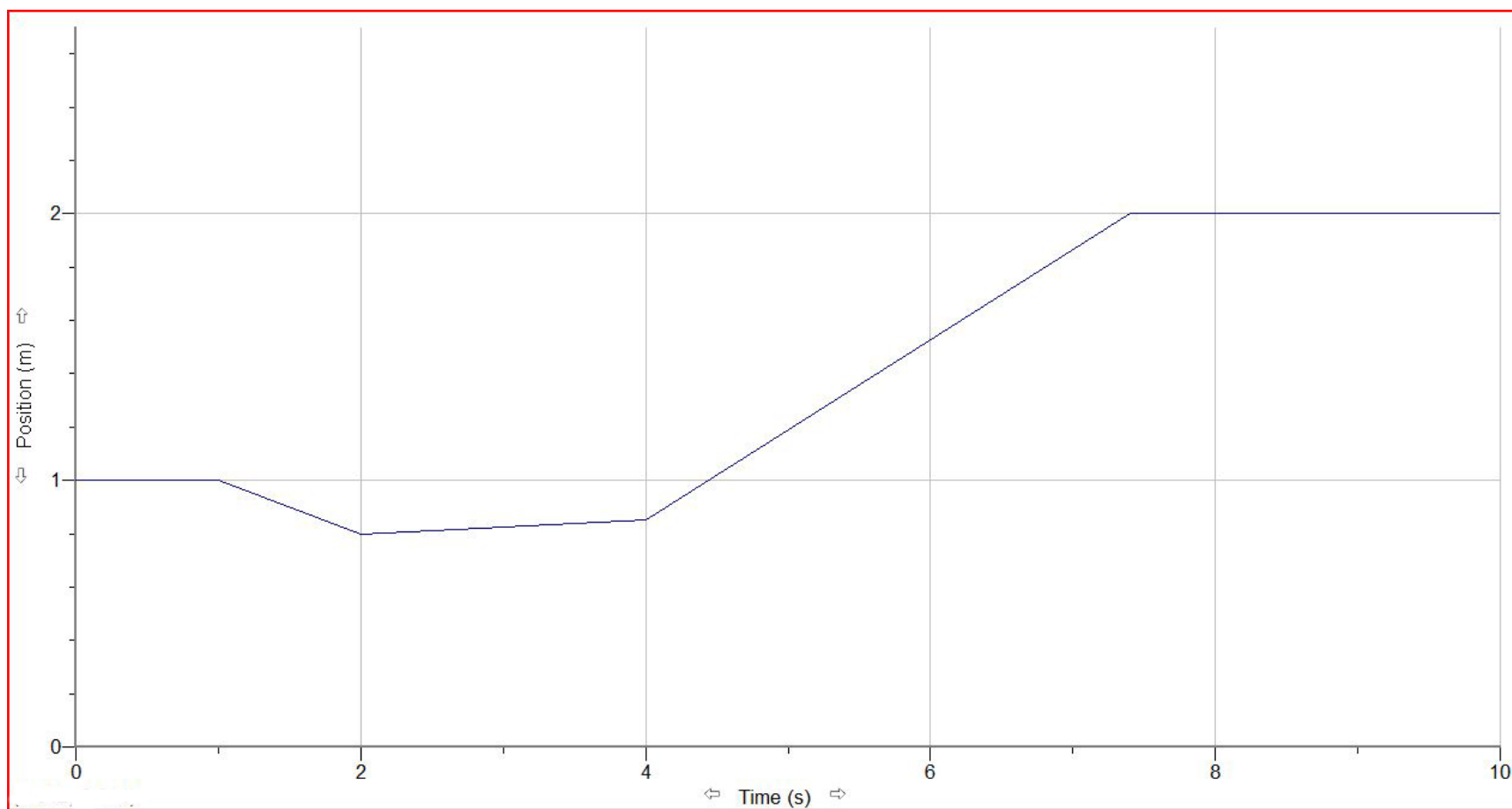
Graph Matching Exercise Graph 3

In the graph provided below, explain what is happening in each section of the graph. You should include the time taken, and state if the distance from the object has increased, decreased or stays the same.



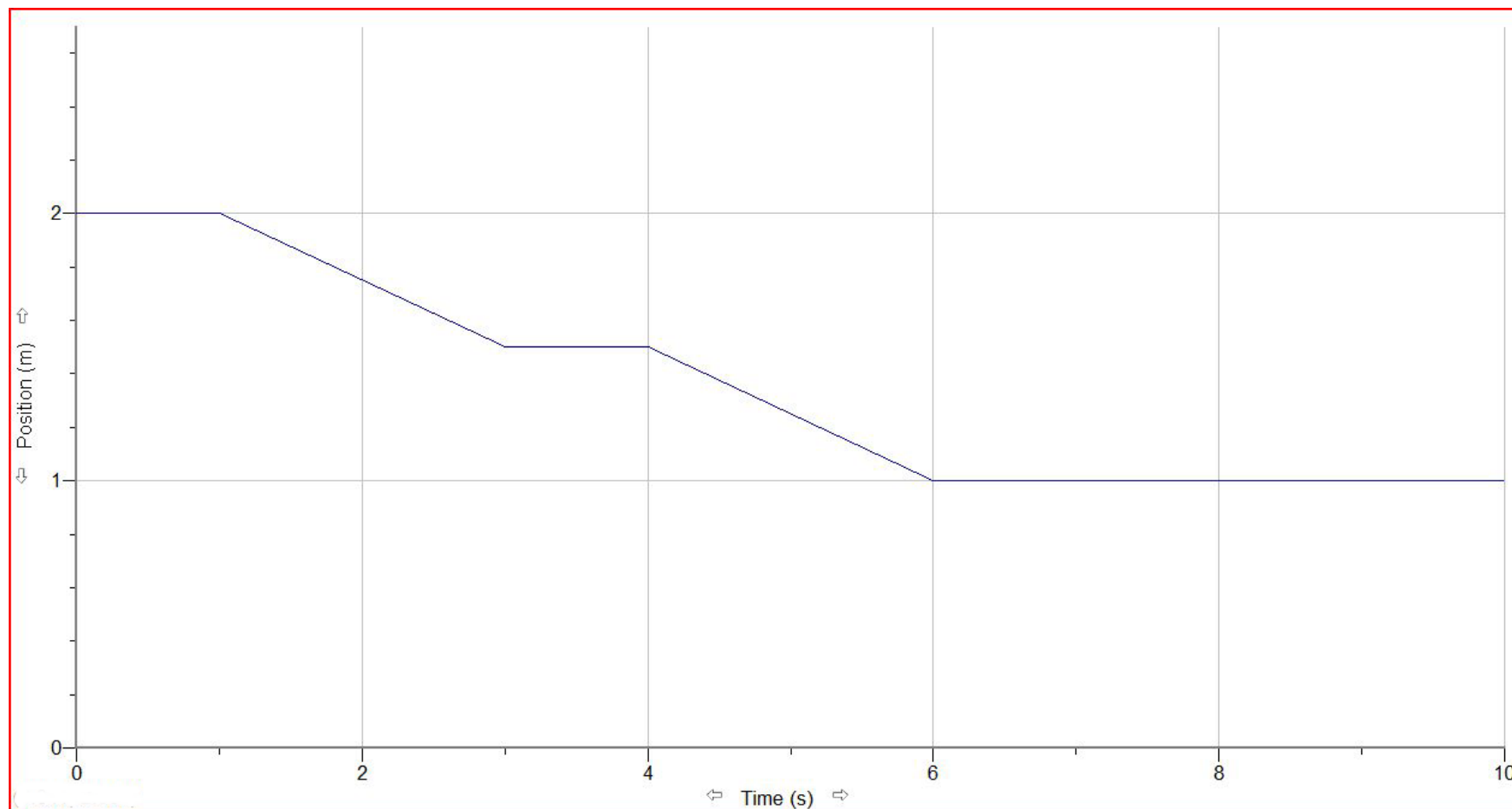
Graph Matching Exercise Graph 4

In the graph provided below, explain what is happening in each section of the graph. You should include the time taken, and state if the distance from the object has increased, decreased or stays the same.



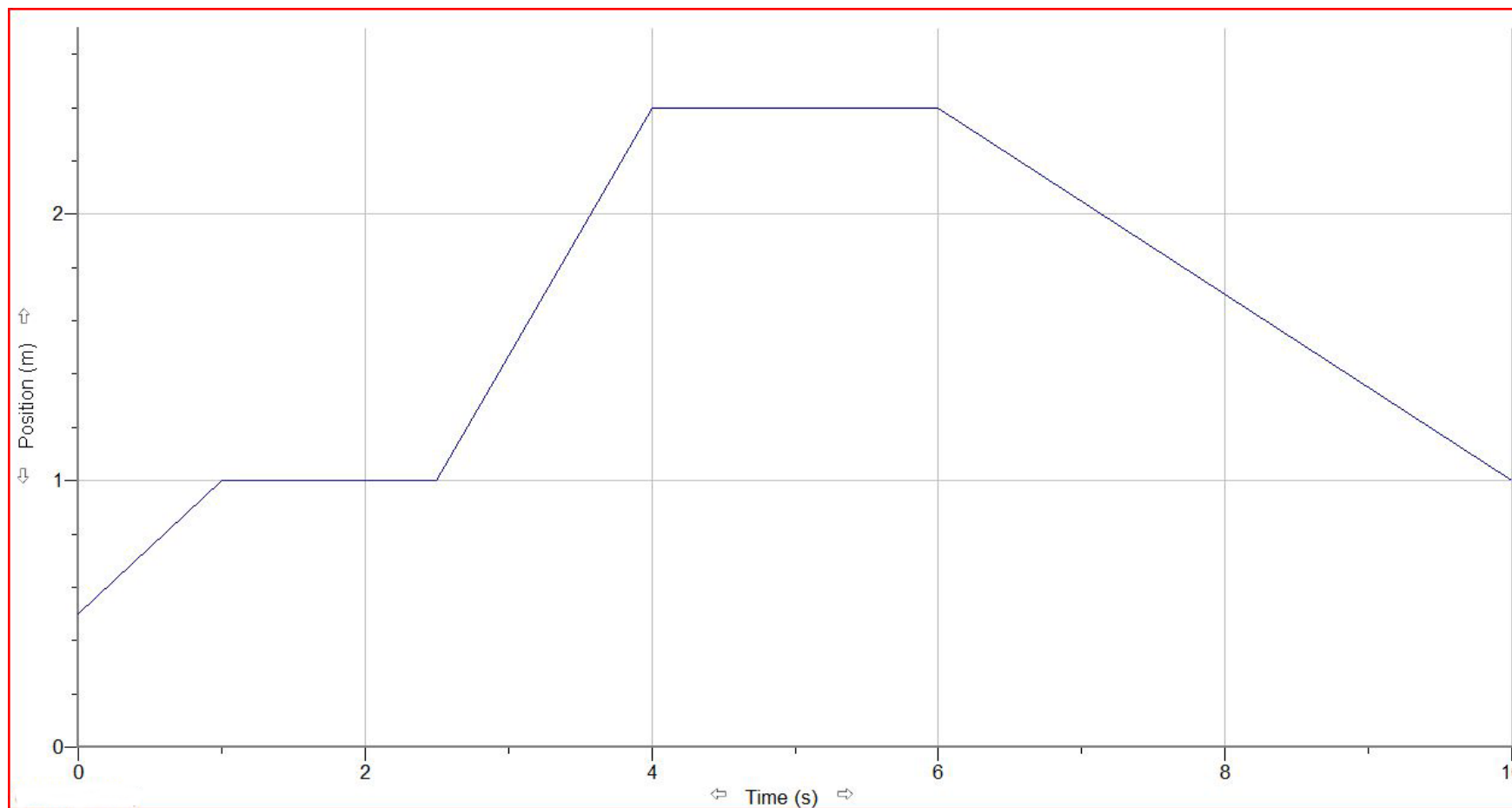
Graph Matching Exercise Graph 5

In the graph provided below, explain what is happening in each section of the graph. You should include the time taken, and state if the distance from the object has increased, decreased or stays the same.



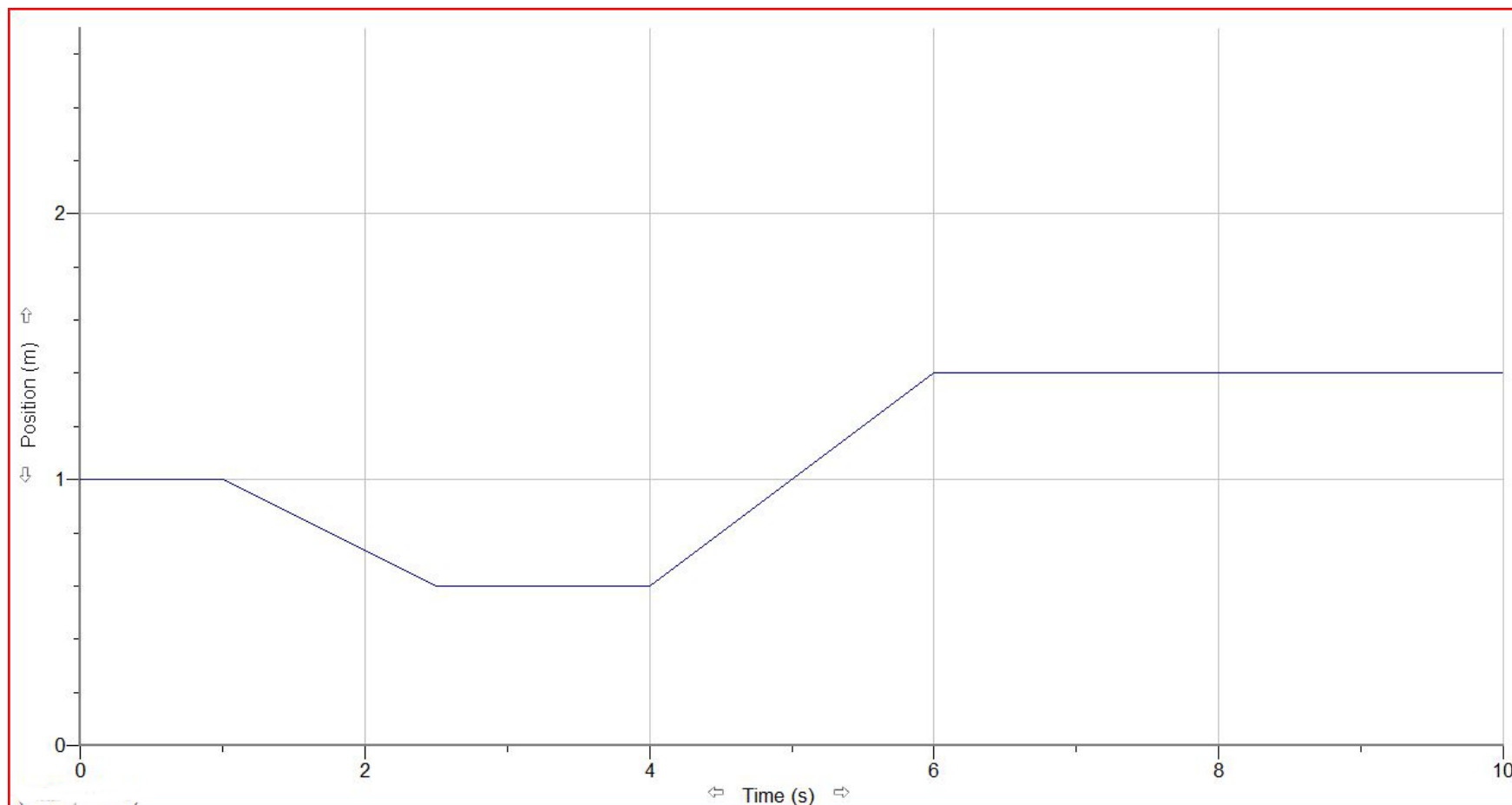
Graph Matching Exercise Graph 6

In the graph provided below, explain what is happening in each section of the graph. You should include the time taken, and state if the distance from the object has increased, decreased or stays the same.



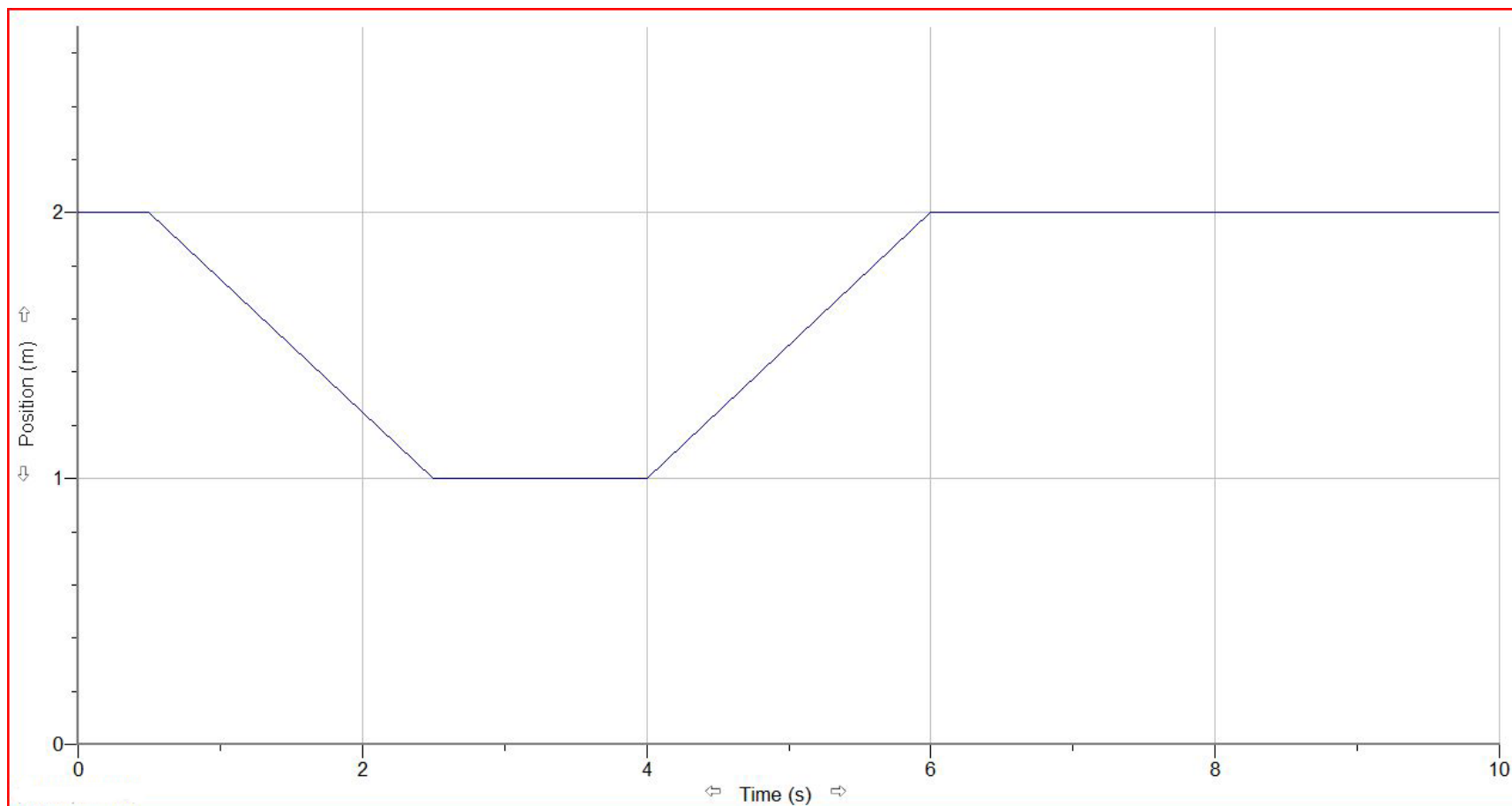
Graph Matching Exercise Graph 7

In the graph provided below, explain what is happening in each section of the graph. You should include the time taken, and state if the distance from the object has increased, decreased or stays the same.



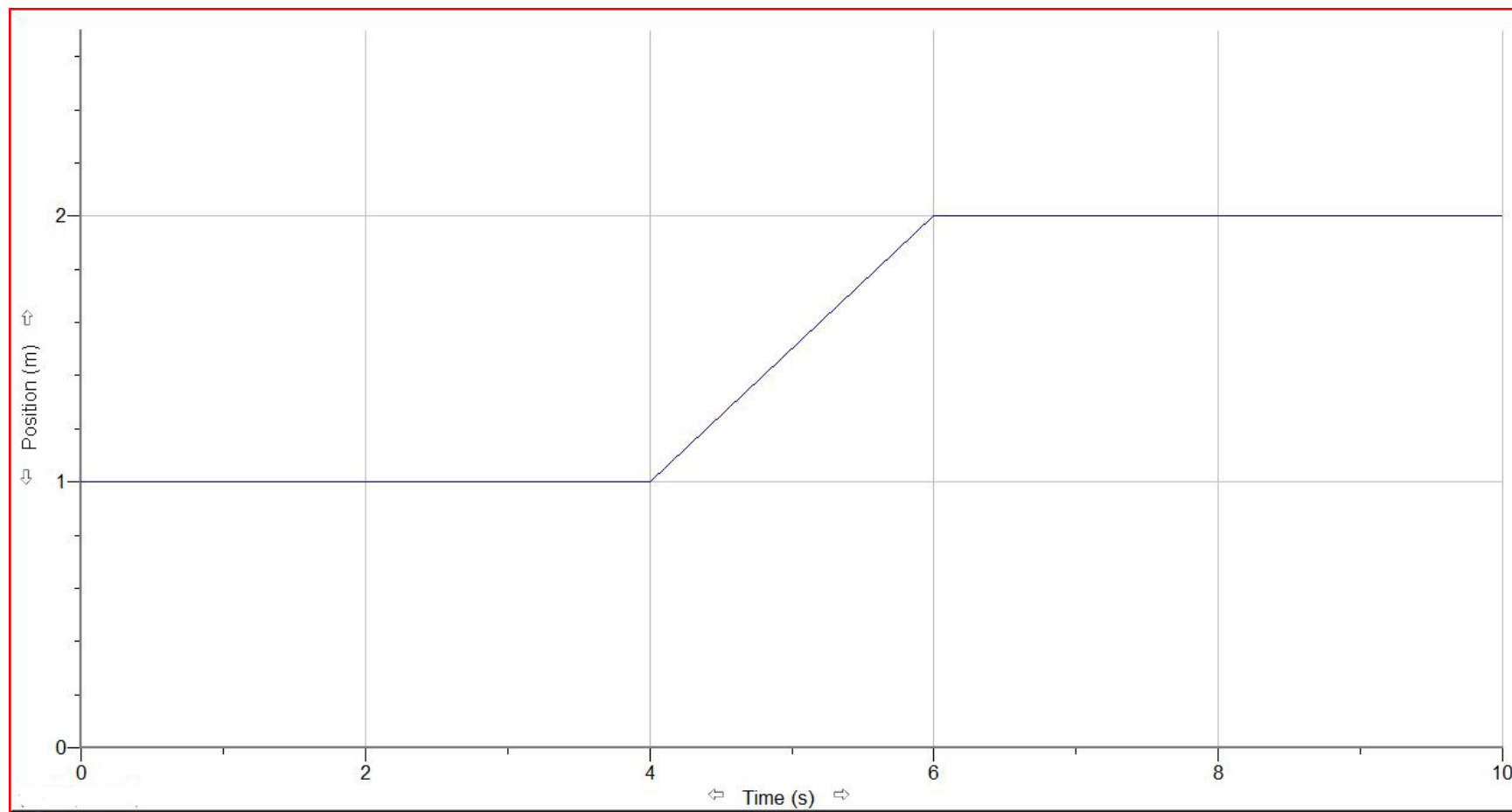
Graph Matching Exercise Graph 8

In the graph provided below, explain what is happening in each section of the graph. You should include the time taken, and state if the distance from the object has increased, decreased or stays the same.



Graph Matching Exercise Graph 9

In the graph provided below, explain what is happening in each section of the graph. You should include the time taken, and state if the distance from the object has increased, decreased or stays the same.



Graph Matching Exercise Graph 10

In the graph provided below, explain what is happening in each section of the graph. You should include the time taken, and state if the distance from the object has increased, decreased or stays the same.

