

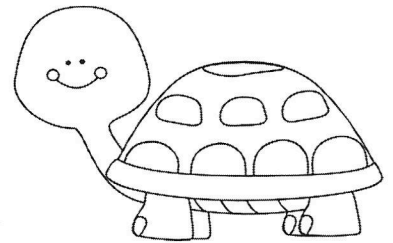
## Open Response

16. Three turtles are in a 100m race. They are moving at different speeds:

<b>Turtle A</b>	Travels 10m every minute
<b>Turtle B</b>	Travels 1m in the first minute. It travels 2m in the second minute. It travels 4m in the third minute. Turtle B keeps travelling double the distance covered in the previous minute
<b>Turtle C</b>	Travels 5m every minute, but it has been given a head start of 40 m.

Which turtle wins the race? Which turtle comes in last? Show how you know.

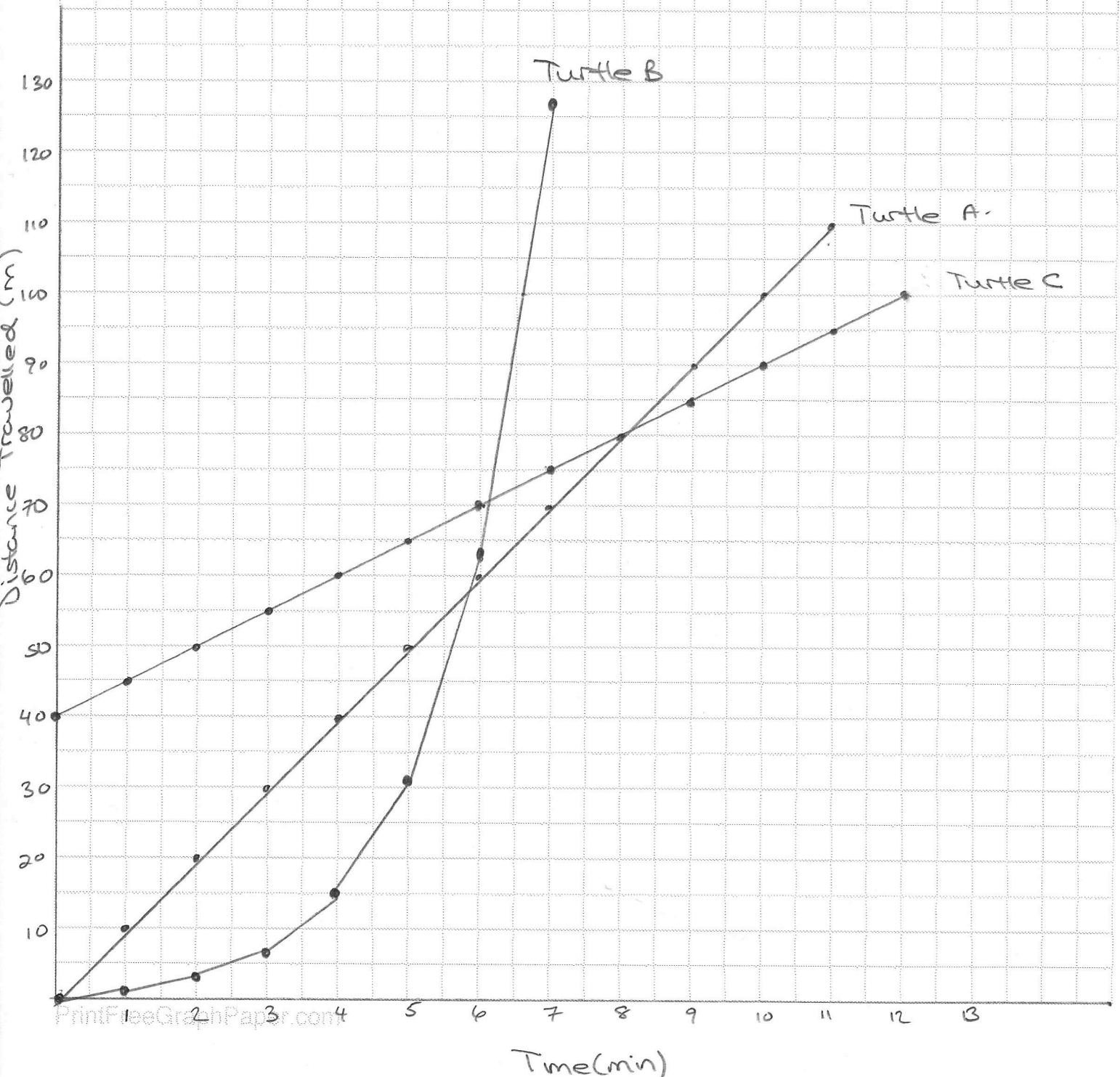
- Two possible solutions are attached.



# Possible Solution 1

- Turtle B reaches 100 m after about 6.5 min
- Turtle A reaches 100 m after 10 min
- Turtle C reaches 100 m after 12 min.

So, Turtle B wins the race.



## Possible Solution 2

## Three Turtles in a Race

Turtle A		
Time (min)	Distance travelled that minute (m)	Total Distance Travelled (m)
0	0	0
1	10	10
2	10	20
3	10	30
4	10	40
5	10	50
6	10	60
7	10	70
8	10	80
9	10	90
10	10	100

Turtle B		
Time (min)	Distance travelled that minute (m)	Total Distance Travelled (m)
0	0	0
1	1	1
2	2	3
3	4	7
4	8	15
5	16	31
6	32	63
7	64	127
8	128	255
9	256	511
10	512	1023

Turtle A		
Time (min)	Distance travelled that minute (m)	Total Distance Travelled (m)
0	0	40
1	5	45
2	5	50
3	5	55
4	5	60
5	5	65
6	5	70
7	5	75
8	5	80
9	5	85
10	5	90
11	5	95
12	5	100

- Turtle A reaches 100 m at 10 min, Turtle B reaches 100m between 6 and 7 min and Turtle C reaches 100m after 12 min. So, turtle B wins the race.

17. Alanna and Alexis are at a department store, which is offering an additional 50% off for only one day. They see a shirt for \$50 that is in a clearance section. All the items in the clearance section are 30% off. Alexis decides to buy the shirt and she is very excited because she thinks she will get an 80% discount. Alanna disagrees and claims that total discount will be less than 80%. At the checkout, the sales attendant takes 30% of the original price and then takes an additional 50% off the sales price. Who was right? Explain your thinking.



• Two possible solutions are attached.

# Possible Solution 1

Alanna's thinking:

Shirt cost \$50.00

Discount: 30%

$$\$50 \times \frac{30}{100} = \$15.00$$

Cost after 30% Discount:

$$50.00 - 15.00 = \$35.00$$

Additional 50% Discount:

$$\$35.00 \times 0.50 = \$17.50$$

Final Cost:

$$\$35.00 - 17.50 = \$17.50$$

Original cost: \$50.00

Final cost: \$17.50

$$\frac{17.50}{50.00} \times 100 = 35\% \text{ of original}$$

∴ 65% Discount, not

80%

So, Alanna is correct.

## Possible Solution 2

Regular Price : \$50.00

30% off of \$50.00

$$100\% - 30\% = 70\%$$

$$\begin{aligned} 70\% \text{ of } \$50.00 &= 0.70 \times \$50 \\ &= \$35.00 \end{aligned}$$

Additional 50% Discount off of \$35.00

$$100\% - 50\% = 50\%$$

$$\begin{aligned} 50\% \text{ of } \$35 &= 0.50 \times \$35 \\ &= \$17.50 \end{aligned}$$

Alexis' thinking,

Regular Price : \$50.00

$$50\% + 30\% = 80\%$$

$$100\% - 80\% = 20\%$$

$$20\% \text{ of } \$50.00 = \$10.00$$

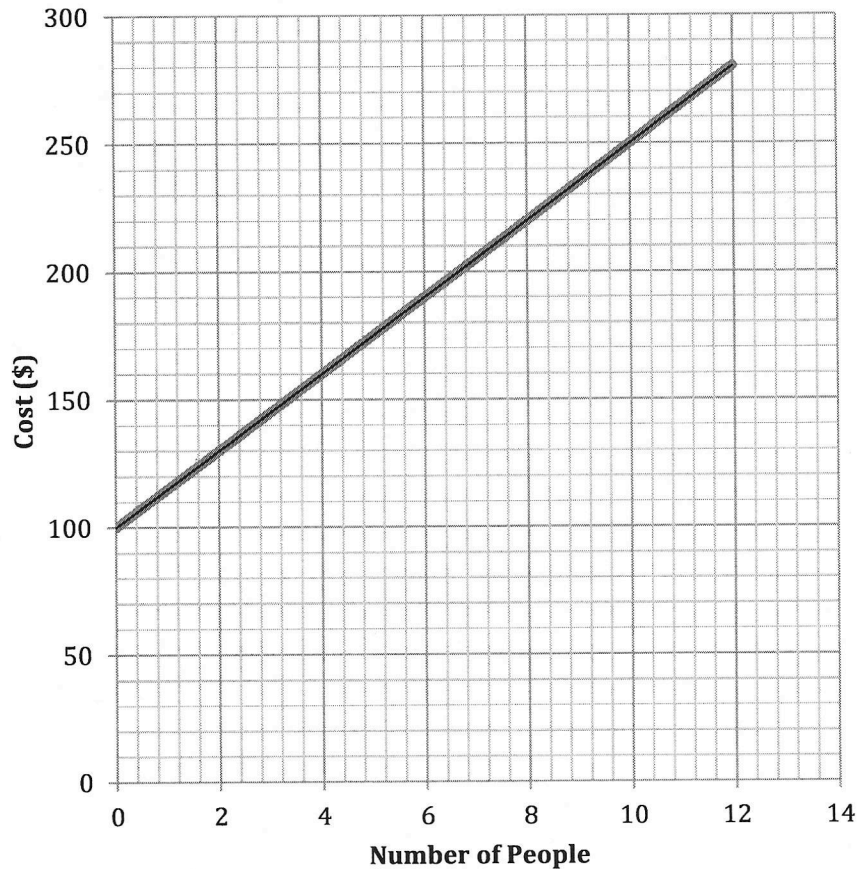
Alanna is right because the total discount of 80% would have resulted in the final cost of \$10, but the cashier's method resulted in the final cost of \$17.50. This discount is less than 80%.

18. Nicole is planning an event and needs to find a banquet centre. The total cost of a banquet includes a fixed fee to rent the hall and a cost per person. Information about the total cost at two different halls is shown below. Which hall's total cost includes a lower cost per person. Justify your answer.

Hall A

Number of People, $n$	Total Cost (\$)
10	275
20	450
30	625

Hall B



Hall A

$$\begin{aligned} \text{rate of change} &= \frac{625 - 450}{30 - 20} \\ &= \frac{175}{10} \\ &= \$17.50 \text{ per person} \end{aligned}$$

Hall B

$$\begin{aligned} \text{rate of change} &= \frac{130 - 250}{2 - 10} \\ &= \frac{-120}{-8} \\ &= \$15.00 \text{ per person} \end{aligned}$$

- Hall B has a lower cost per person.

19. During Canada Day celebrations, a firework is launched upward at an initial velocity of 49m/s, from a height of 1.5m above the ground. The height of the firework, in metres, after  $t$  seconds is modeled by the equation

$$h = -4.9t^2 + 49t + 1.5.$$

- a) What is the maximum height of the firework above the ground?

$$0 = -4.9t^2 + 49t + 1.5$$

$$t = \frac{-49 \pm \sqrt{49^2 - 4(-4.9)(1.5)}}{2(-4.9)}$$

$$= \frac{-49 \pm \sqrt{2430.4}}{-9.8}$$

$$= \frac{-49 \pm 49.30}{-9.8}$$

$$t = \frac{-49 + 49.30}{-9.8} \text{ and } t = \frac{-49 - 49.30}{-9.8}$$

$$\approx 0s \text{ and } \approx 10s.$$

⇓  
maximum height occurs at about 5s.

$$h = -4.9(5)^2 + 49(5) + 1.5$$

$$h = 124 \text{ m.}$$

maximum height.

- b) Over what time interval is the height of the firework greater than 100m above the ground?

$$-4.9t^2 + 49t + 1.5 > 100$$

$$-4.9t^2 + 49t - 98.5 > 0.$$

$$t = \frac{-49 \pm \sqrt{49^2 - 4(-4.9)(-98.5)}}{2(-4.9)}$$

$$= \frac{-49 \pm \sqrt{470.4}}{-9.8}$$

$$= \frac{-49 \pm 21.7}{-9.8}$$

$$t = \frac{-49 + 21.7}{-9.8} = 2.8s$$

and

$$t = \frac{-49 - 21.7}{-9.8} = 7.2s$$

The firework is greater than 100 m between 2.8s and 7.2s.

