



GRADE 10 NUMERACY ASSESSMENT



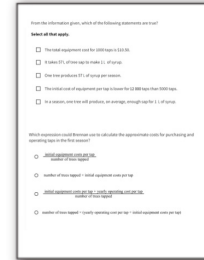
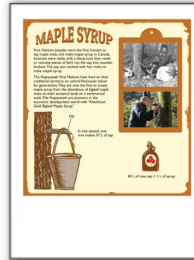
Ministry of
Education and
Child Care



Common Section

In this part you will:

- read two tasks
- complete 6 questions for each task



MAPLE SYRUP

First Nations peoples were the first humans to tap maple trees and make maple syrup in Canada. Incisions were made with a sharp tool, then reeds or concave pieces of bark ran the sap into wooden buckets. The sap was cooked with hot rocks to make maple syrup.

The Hupacasath First Nations have lived on their traditional territory on central Vancouver Island for generations. They are now the first to create maple syrup from the abundance of bigleaf maple trees on their ancestral lands on a commercial scale. The Hupacasath are pioneers in the economic development world with “Kleekhoot Gold Bigleaf Maple Syrup.”



In one season, one tree makes 57 L of sap



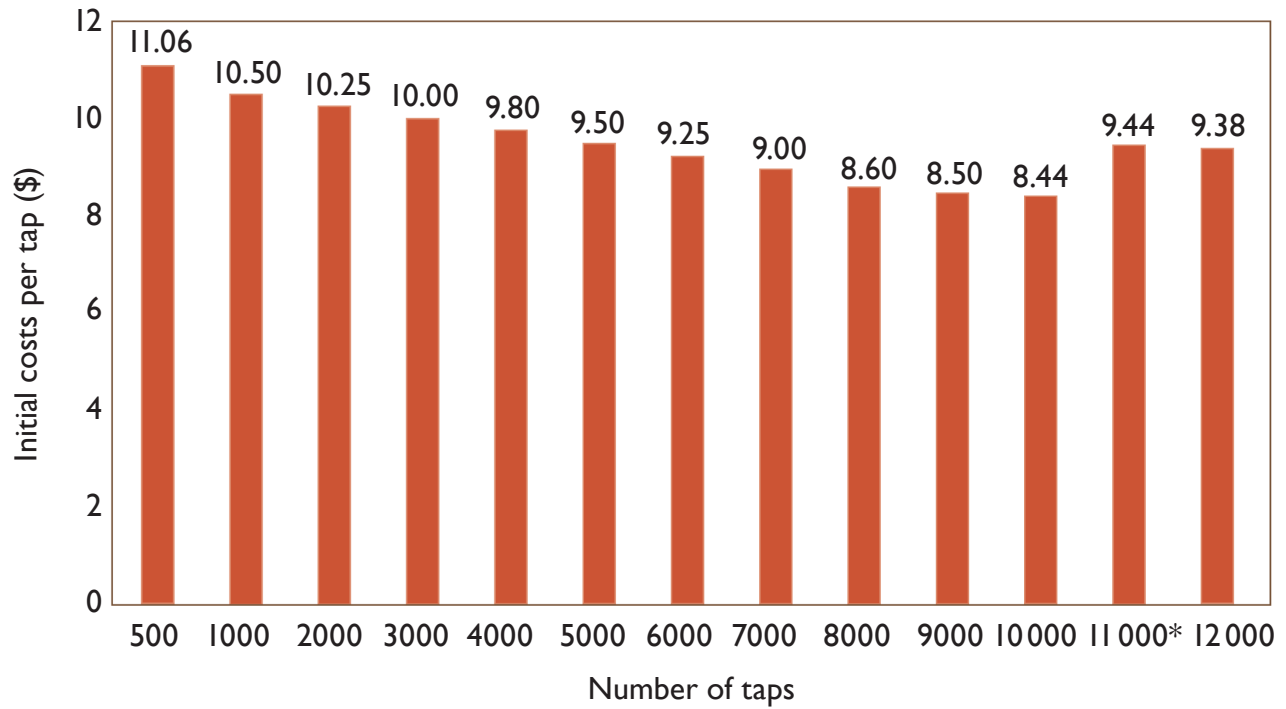
40 L of tree sap = 1 L of syrup

After visiting the Hupacasath's operation, Brennan, a member of another First Nations, wants to explore tapping maple trees and making syrup on the traditional territories where he lives. He counted over 5000 maple trees on their ancestral lands.

Brennan has researched the costs involved in syrup production. The costs include buying equipment to collect and process the tree sap, as well as operating the taps for one season.

Brennan plans to make a presentation to Chief and Council for permission to start operating on a small number of trees. Each tree will require one tap.

Initial cost of equipment per tap



*Additional equipment needed for 11 000 and above.

Cost of operating taps for one season	
Number of taps	Operational cost (per tap)
500	\$6.50
2000	\$3.40
4000	\$2.88
6000	\$2.68
8000	\$2.62
10 000	\$2.58
12 000	\$2.85

From the information given, which of the following statements are true or false?

	True	False
The total equipment cost for 1000 taps is \$10.50.	<input type="checkbox"/>	<input type="checkbox"/>
It takes 57 L of tree sap to make 1 L of syrup.	<input type="checkbox"/>	<input type="checkbox"/>
One tree produces 57 L of syrup per season.	<input type="checkbox"/>	<input type="checkbox"/>
The initial cost of equipment per tap is lower for 12 000 taps than 5000 taps.	<input type="checkbox"/>	<input type="checkbox"/>
In a season, one tree will produce, on average, enough sap for 1 L of syrup.	<input type="checkbox"/>	<input type="checkbox"/>

Which expression could Brennan use to calculate the approximate costs for purchasing and operating taps in the first season?

- ☐ $\frac{\text{initial equipment costs per tap}}{\text{number of trees tapped}}$
- ☐ number of trees tapped \times initial equipment costs per tap
- ☐ $\frac{\text{initial equipment costs per tap} + \text{yearly operating cost per tap}}{\text{number of trees tapped}}$
- ☐ number of trees tapped \times (yearly operating cost per tap + initial equipment costs per tap)

Question 3

Scenario: Maple Syrup

Set up the expression to represent the maximum volume of syrup Brennan could obtain from 1000 trees.

<div>▼</div> <div>40</div> <div>57</div> <div>1000</div>	<div>▼</div> <div>+</div> <div>−</div> <div>×</div> <div>÷</div>	<div>▼</div> <div>40</div> <div>57</div> <div>1000</div>	<div>▼</div> <div>+</div> <div>−</div> <div>×</div> <div>÷</div>	<div>▼</div> <div>40</div> <div>57</div> <div>1000</div>
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If Brennan taps 2000 trees in his first season, determine the total cost to produce each litre of syrup.

- ☐ \$0.10
- ☐ \$0.34
- ☐ \$7.19
- ☐ \$9.58
- ☐ \$14.61

If Brennan runs 500 taps in his first season, what percentage of his expense per tap is to operate the taps?

 %

If Brennan's syrup production and sales remain the same, it would be reasonable to predict that next season's profit will



decrease
be similar
increase

because



the same trees are tapped.
operating costs will increase.
equipment costs will decrease.

Reasoned Estimates: Solar Energy Project

The following information can be found on a typical energy bill.



Billing Date: January 15

Account Number:
78654321

Pay By: February 06

Meter Reading Information

Meter #	5620624
Dec 01	7305
Dec 31	8020
31 days	715

Daily Average Comparison

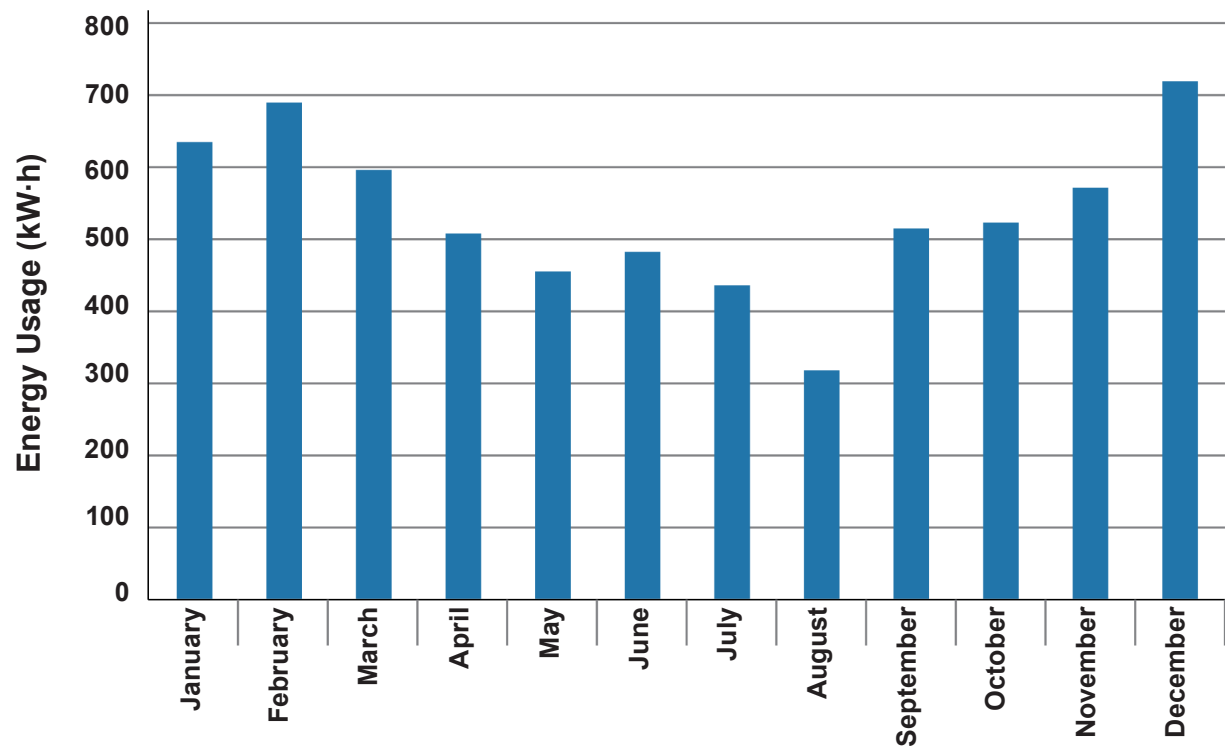
Last Dec:	19 kW·h
This Dec:	25 kW·h

Electric Charges (Dec 01 to Dec 31)

Basic charge: 31 days @ \$0.18350 / day	\$5.69
Energy charge:	
Step 1: 644 kWh @ \$0.08290 / kW·h	53.39
Step 2: 71 kWh @ \$0.12430 / kW·h	8.83
Temporary delivery surcharge @ 5.0%	3.11
Regional transit levy: 31 days @ \$0.06240 / day	1.93
GST (5%)	3.65
Total	\$76.60

Balance payable \$76.60

Monthly Energy Usage





Solar panels can help to reduce environmental impact and save money on electricity by converting the sun's energy into electrical energy.

Depending on conditions and sunlight, one panel can generate up to 1.5 kW·h per day.

The energy bill shows the monthly energy usage.

Which month(s) had monthly energy usage above 600 kW·h?

Select all that apply.

- ☐ January
- ☐ February
- ☐ March
- ☐ April
- ☐ May
- ☐ June
- ☐ July
- ☐ August
- ☐ September
- ☐ October
- ☐ November
- ☐ December

Question 8

Scenario: Solar Energy Project

Create an expression that represents the difference in average daily energy usage between the highest and lowest months.

905

715

595

315

250

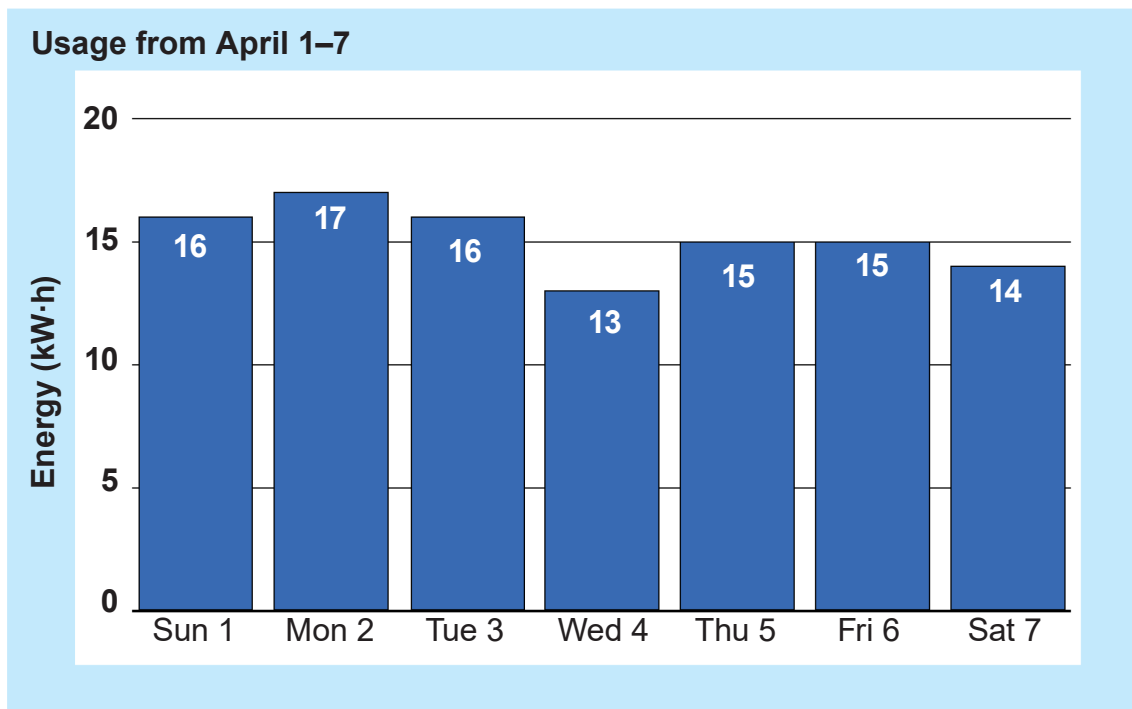
28

30

31

<div></div>	-	<div></div>
<div></div>		<div></div>

Use the following graph to answer the question.



In April, based on 3 hours of direct sunlight daily, one solar panel produces 0.90 kW·h per day.

Based on the information above, what expression would allow you to find how many solar panels are needed to meet your highest daily energy use between April 1–7?

☐ $\frac{17}{0.90}$

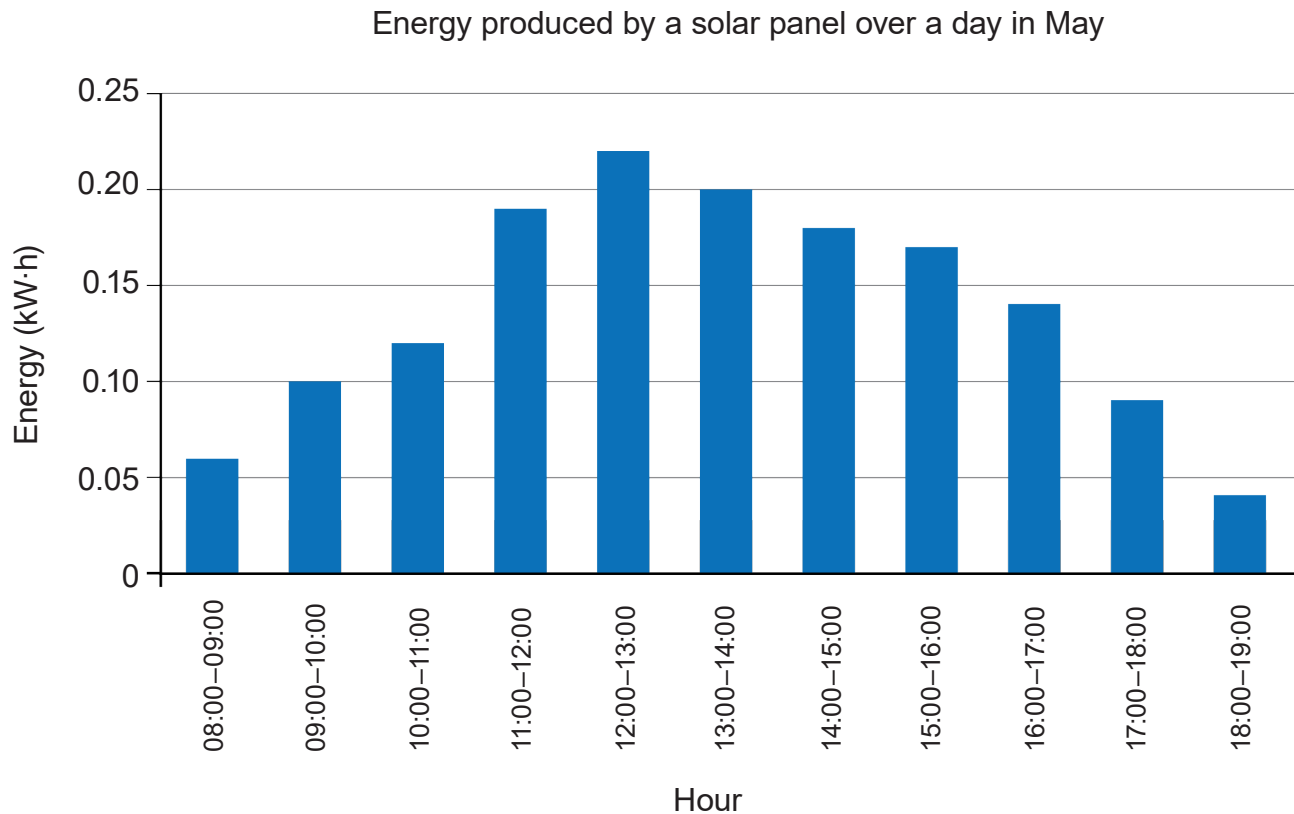
☐ $\frac{106}{0.90}$

☐ 17×0.90

☐ $\frac{0.90 \times 3}{17}$

Use the graph to answer the question.

The graph shows the electrical energy produced by a solar panel over a typical day in the month of May.



Which is the best percentage estimate of the energy produced **between** 11:00 and 14:00 on that day?

- ☐ 20% ☐ 40%
- ☐ 60% ☐ 80%

You have 20 solar panels on your house. Each panel generates an average of 1.1 kW·h per day during the month of September.

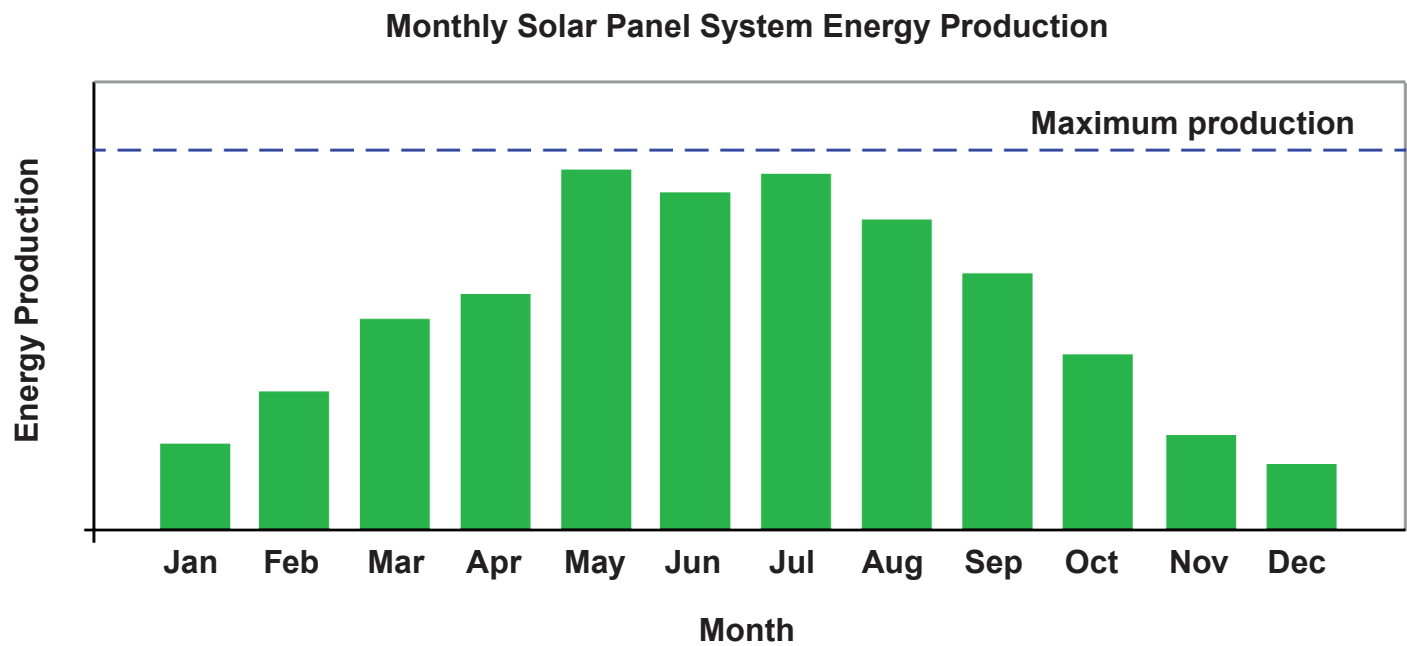
Considering the average energy usage in the month of September, what would be the approximate difference between the energy consumed and the energy produced by the solar panels?

The panels will produce kW·h  than the average monthly energy usage.

more

less

Use the graph to answer the question.



You are considering the installation of a solar panel system capable of generating about 30 kW·h per day under good conditions. Will your solar panel system meet your energy demands?

The system would be

sufficient

insufficient

because

energy usage is higher in the summer.

panels produce less energy in the winter.

there are more hours of sunlight in the winter.

30 kW·h meets your highest daily energy usage.

each solar panel consistently generates enough energy daily.

Student Choice Section

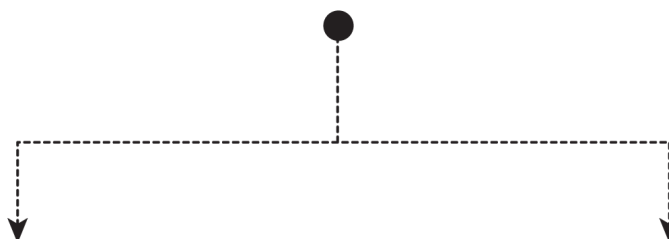


responses completed on paper response sheet

Choose the numeracy task for which you would like to complete an extensive constructed response question. These questions are a logical progression from where the tasks are headed.

Decide carefully.

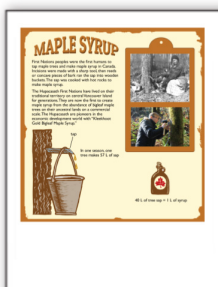
You will have to complete the question you chose.



Topic

1

Maple Syrup



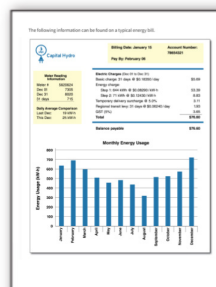
Determine the plot of land that Brennan should choose for his business.

SELECT

Topic

2

Solar Energy Project

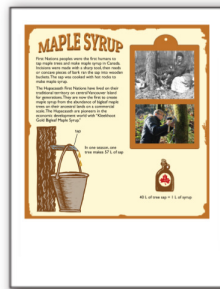


Estimate energy output of solar panel system.

SELECT

You have chosen:

Maple Syrup



Determine the plot of land that Brennan should choose for his business.

Question 13

Plan and Design: Maple Syrup

Answer this question on the indicated response sheet.

Brennan's First Nations community has accepted his business plan and offered him access to one of three plots of land with different maple tree densities. He agrees to pay \$5000 for each hectare (ha) of land he uses for one season.

His options are:

Plot	Area	Tree Density
Plot 1	2 ha	1000 trees/ha
Plot 2	8 ha	500 trees/ha
Plot 3	16 ha	375 trees/ha

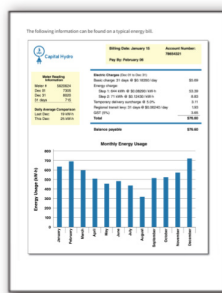
He plans to sell the syrup at \$15/L. He already owns the equipment needed to collect and process the tree sap.

Considering only the land lease, operating costs, and profit, which area should Brennan choose?

Explain and justify your solution. Be sure to include any calculations, estimations, and assumptions you used.

You have chosen:

Solar Energy Project



Estimate energy output of
solar panel system.

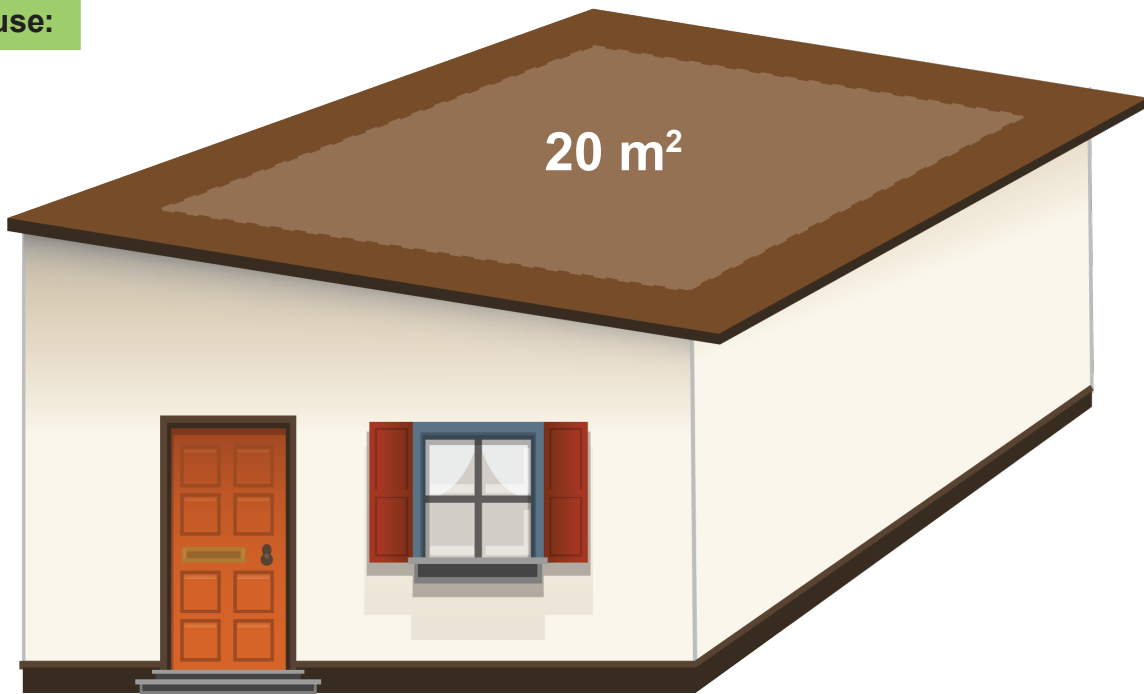
Question 13

Reasoned Estimates: Solar Energy Project

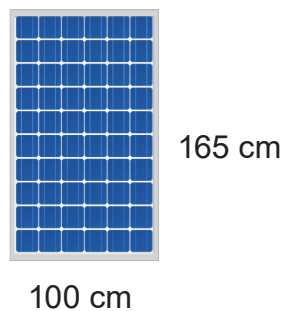
Answer this question on the indicated response sheet.

The roof of a house has an available area of 20 m^2 for solar panel installation.

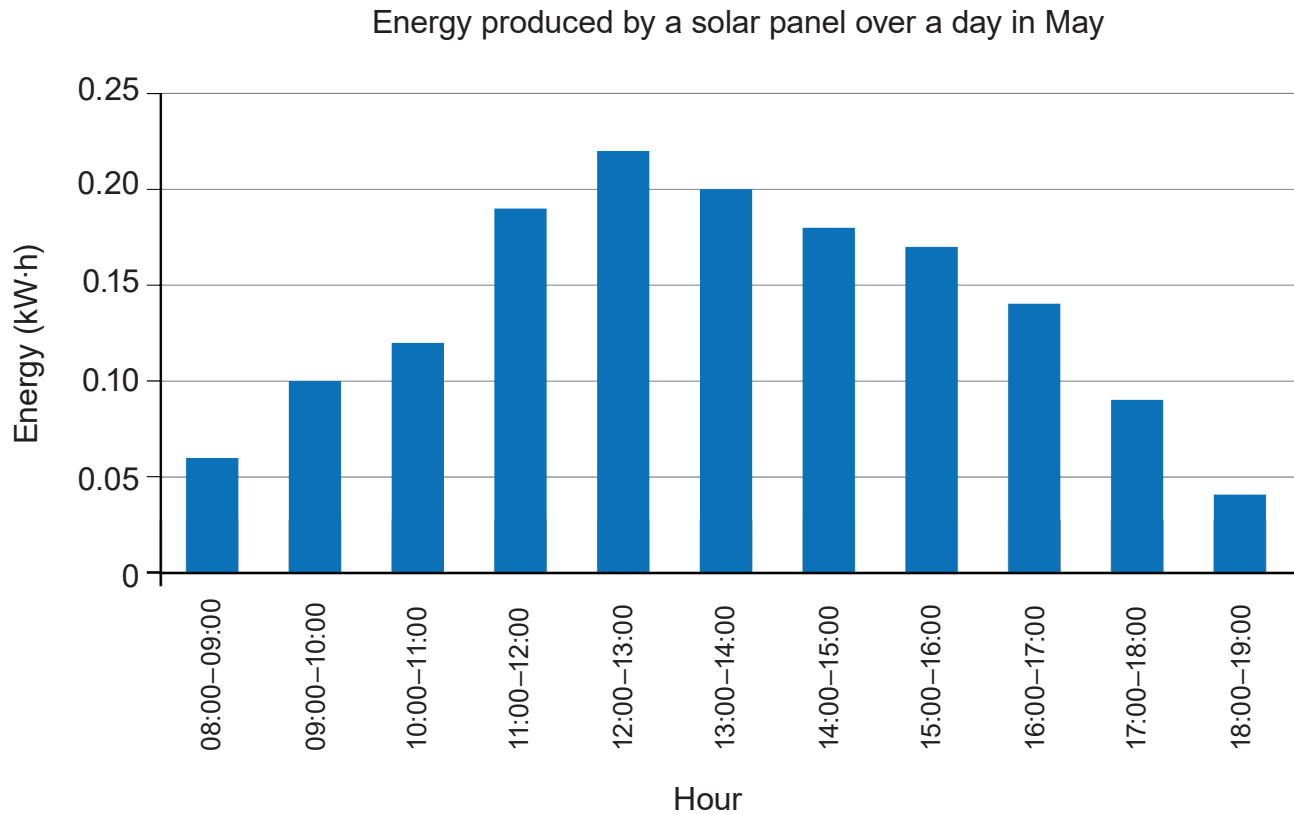
House:



Solar panel:



Consider the following information for a new solar energy system on the roof:



Based on the information in the energy bill, would the roof area fit the number of panels needed to produce enough energy for May?

Explain and justify your solution. Be sure to include any calculations, estimations, labels, and assumptions you made.

Common Section

In this part you will:

- read two tasks
- complete 6 questions for each task

Table 1: Summer weather (temperatures) and daily ice cream sales

The school is a playground and opened an ice cream stand that will be in business during the weekends of this summer. In order to know how much ice cream to buy, the school will use data collected between the Canada Day and B.C. Day weekends (Table 1).

Date	Location	Maximum Daily Temperature	Sales
June 30	Canada Day	18°C	\$215
July 1	City	21°C	\$227
July 2	Weekend	17°C	\$195
July 3		20°C	\$202
July 4		24°C	\$428
July 14		23°C	\$235
July 15		24°C	\$210
July 21		18°C	\$202
July 22		22°C	\$408
July 28		22°C	\$421
August 4	B.C. Day	21°C	\$359
August 5	City	20°C	\$368
August 6	Weekend	22°C	\$319

Use the information from Table 1 to answer this question.

Indicate which of the following statements is true or false.

	True	False
Between the weekend in early May and the weekend in early June, the school sold more ice cream than the weekend in May.	<input type="checkbox"/>	<input type="checkbox"/>
Between the weekend in the middle of May and the weekend in the middle of June, the school sold more ice cream than the weekend in May.	<input type="checkbox"/>	<input type="checkbox"/>
Between the weekend in the middle of May and the weekend in the middle of June, the school sold more ice cream than the weekend in May.	<input type="checkbox"/>	<input type="checkbox"/>
Between the weekend in the middle of May and the weekend in the middle of June, the school sold more ice cream than the weekend in May.	<input type="checkbox"/>	<input type="checkbox"/>
Between the weekend in the middle of May and the weekend in the middle of June, the school sold more ice cream than the weekend in May.	<input type="checkbox"/>	<input type="checkbox"/>

Smith Dairy

The Smith family runs a dairy farm in their home valley. They produce and deliver a product that provides them with a steady stream of income. However, they also have a large amount of costs to maintain their dairy business. The table below shows the average costs for the farm over time. Each row provides about one year of data.

Year	Cost of milk	Cost of feed	Cost of fuel	Cost of labor	Cost of maintenance	Cost of depreciation	Cost of interest	Cost of insurance	Cost of taxes	Cost of other expenses	Total cost
2017	\$1.20	\$0.80	\$0.50	\$1.50	\$0.30	\$0.20	\$0.10	\$0.05	\$0.02	\$0.01	\$4.68
2018	\$1.30	\$0.85	\$0.55	\$1.55	\$0.35	\$0.25	\$0.15	\$0.08	\$0.03	\$0.02	\$5.00
2019	\$1.40	\$0.90	\$0.60	\$1.60	\$0.40	\$0.30	\$0.20	\$0.10	\$0.05	\$0.03	\$5.38
2020	\$1.50	\$0.95	\$0.65	\$1.65	\$0.45	\$0.35	\$0.25	\$0.12	\$0.06	\$0.04	\$5.77
2021	\$1.60	\$1.00	\$0.70	\$1.70	\$0.50	\$0.40	\$0.30	\$0.15	\$0.08	\$0.05	\$6.18
2022	\$1.70	\$1.05	\$0.75	\$1.75	\$0.55	\$0.45	\$0.35	\$0.18	\$0.10	\$0.06	\$6.59
2023	\$1.80	\$1.10	\$0.80	\$1.80	\$0.60	\$0.50	\$0.40	\$0.20	\$0.12	\$0.07	\$7.00
2024	\$1.90	\$1.15	\$0.85	\$1.85	\$0.65	\$0.55	\$0.45	\$0.22	\$0.14	\$0.08	\$7.42
2025	\$2.00	\$1.20	\$0.90	\$1.90	\$0.70	\$0.60	\$0.50	\$0.25	\$0.16	\$0.09	\$7.85
2026	\$2.10	\$1.25	\$0.95	\$1.95	\$0.75	\$0.65	\$0.55	\$0.28	\$0.18	\$0.10	\$8.28
2027	\$2.20	\$1.30	\$1.00	\$2.00	\$0.80	\$0.70	\$0.60	\$0.30	\$0.20	\$0.11	\$8.71
2028	\$2.30	\$1.35	\$1.05	\$2.05	\$0.85	\$0.75	\$0.65	\$0.32	\$0.22	\$0.12	\$9.14
2029	\$2.40	\$1.40	\$1.10	\$2.10	\$0.90	\$0.80	\$0.70	\$0.35	\$0.24	\$0.13	\$9.57
2030	\$2.50	\$1.45	\$1.15	\$2.15	\$0.95	\$0.85	\$0.75	\$0.38	\$0.26	\$0.14	\$10.00

Some costs for the farm are one-time costs, whereas other costs are ongoing. Drag and drop each expense into the correct column.

One-time costs	Ongoing costs
Cost to purchase land	Cost to purchase seeds
Cost to purchase equipment	Cost to purchase feed
Cost to purchase machinery	Cost to purchase fuel
Cost to purchase labor	Cost to purchase maintenance
Cost to purchase interest	Cost to purchase insurance
Cost to purchase taxes	Cost to purchase other expenses

Model: Ice Cream Shop



You rented a storefront and opened an ice cream shop that will be in business during the weekends of the summer tourist season. You looked over sales data collected between the Canada Day and B.C. Day weekends (Table 1).

Table 1. Summer weekend temperature and daily ice cream sales

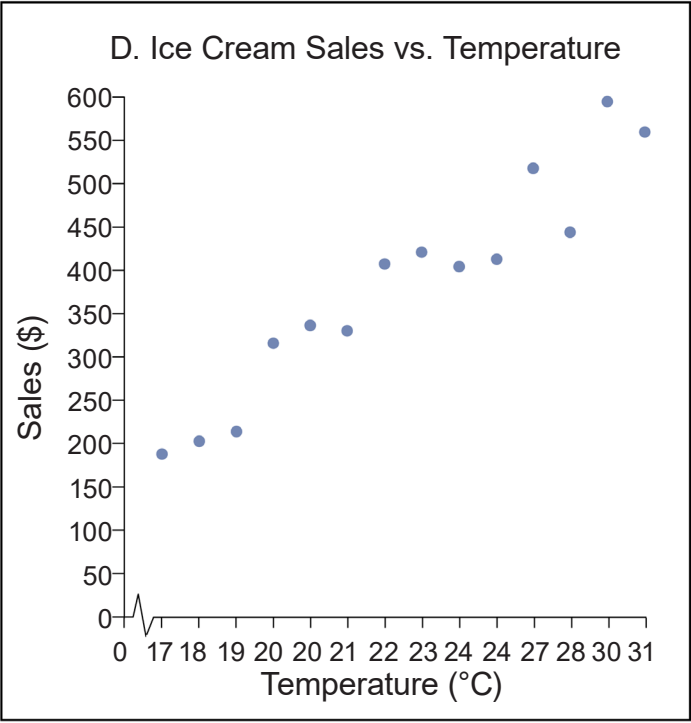
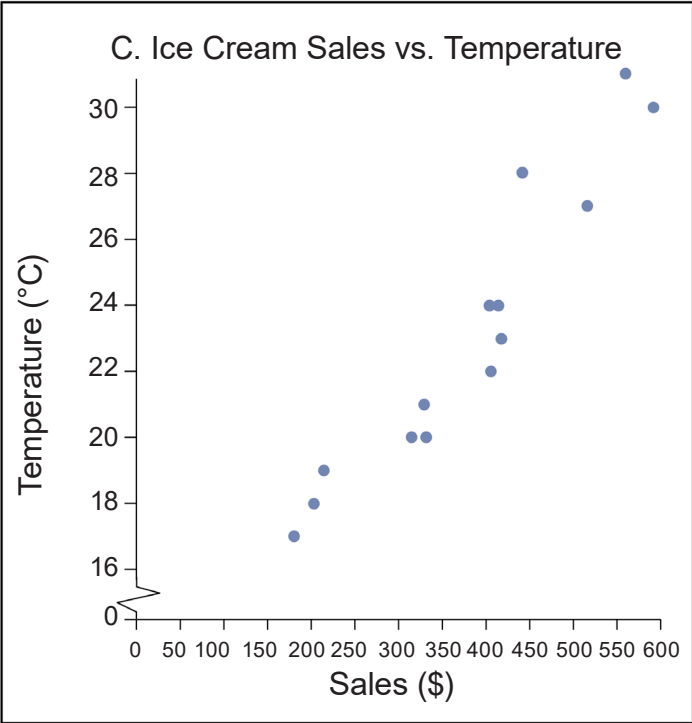
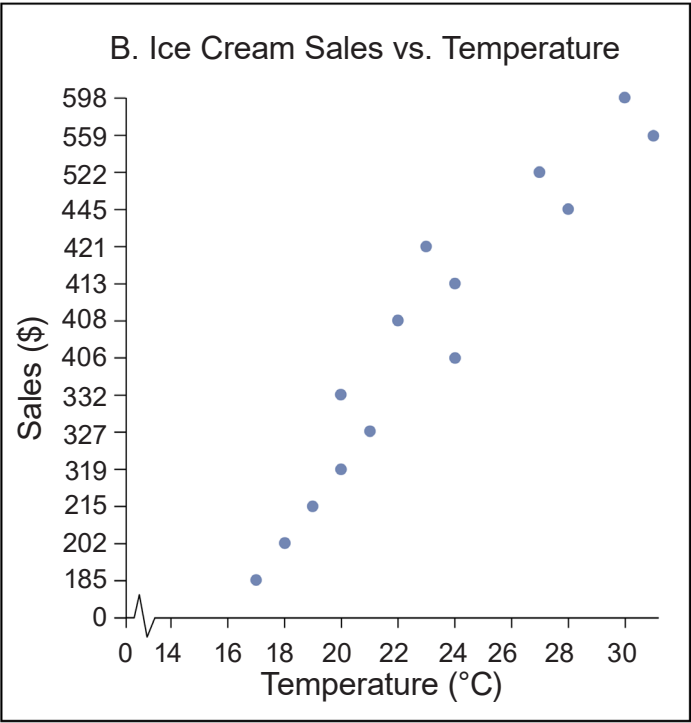
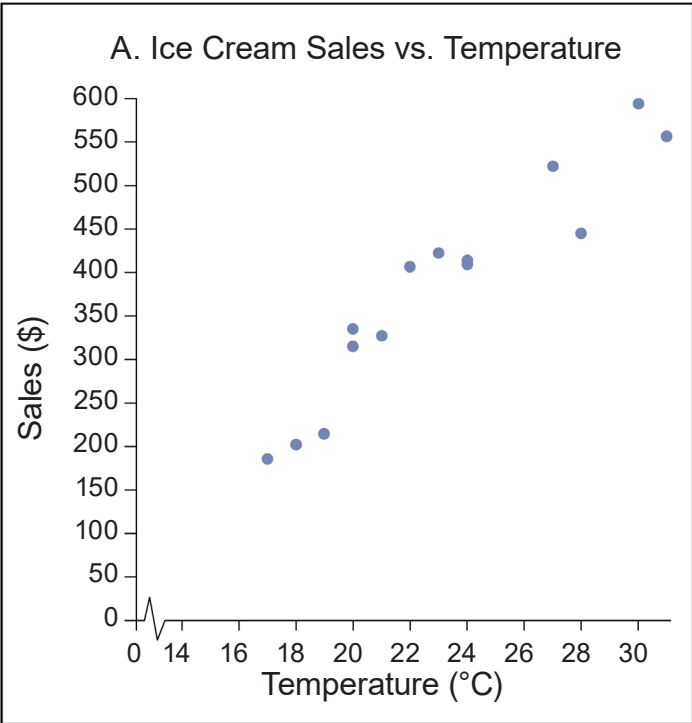
Date		Maximum Daily Temperature	Sales
June 30	Canada Day Weekend	19°C	\$215
July 1		21°C	\$327
July 2		17°C	\$185
July 7		20°C	\$332
July 8		24°C	\$406
July 14		27°C	\$522
July 15		24°C	\$413
July 21		18°C	\$202
July 22		22°C	\$408
July 28		23°C	\$421
July 29		28°C	\$445
August 4	B.C.Day Weekend	31°C	\$559
August 5		30°C	\$598
August 6		20°C	\$319

Use the information from Table 1 to answer this question.

Indicate if each of the following statements is true or false.

	True	False
Sales were the lowest on opening day.	<input type="checkbox"/>	<input type="checkbox"/>
Sales were the lowest on the coldest day.	<input type="checkbox"/>	<input type="checkbox"/>
Sales were the highest on the warmest day.	<input type="checkbox"/>	<input type="checkbox"/>
Sales were approximately the same on the 21°C day and the 24°C days.	<input type="checkbox"/>	<input type="checkbox"/>
Sales were more than twice as much on the 27°C day, compared to the 17°C day.	<input type="checkbox"/>	<input type="checkbox"/>
Sales on the Canada Day weekend were not as high as on the B.C. Day weekend.	<input type="checkbox"/>	<input type="checkbox"/>

Which of the following graphs is accurate and best displays the data in Table 1?



The mean cost to produce each serving of ice cream is \$1.25. You sell each serving for \$4.50.

Which of the following expressions could you use to estimate your approximate profit, in dollars, on July 14?

☐ $\frac{(4.50 - 1.25)}{522}$

☐ $\frac{522}{(4.50 - 1.25)}$

☐ $\frac{522}{1.25} \times (4.50 - 1.25)$

☐ $\frac{522}{4.50} \times (4.50 - 1.25)$

The mean cost to produce each serving of ice cream is \$1.25. You sell each serving for \$4.50.

What is the **markup*** on each serving of ice cream sold?

Record your answer as a percentage.

 %

***markup:** the difference between the cost to owner and the selling price to customers

Determine the difference of the mean values of collected sales data between days where temperature was 24°C or above and days where temperature was 20°C or below.

Round your answer to the nearest dollar.

The difference is \$







Question 19

Scenario: Ice Cream Shop

How might the factors below affect your total ice cream sales and total profit if you do not plan to change your prices?

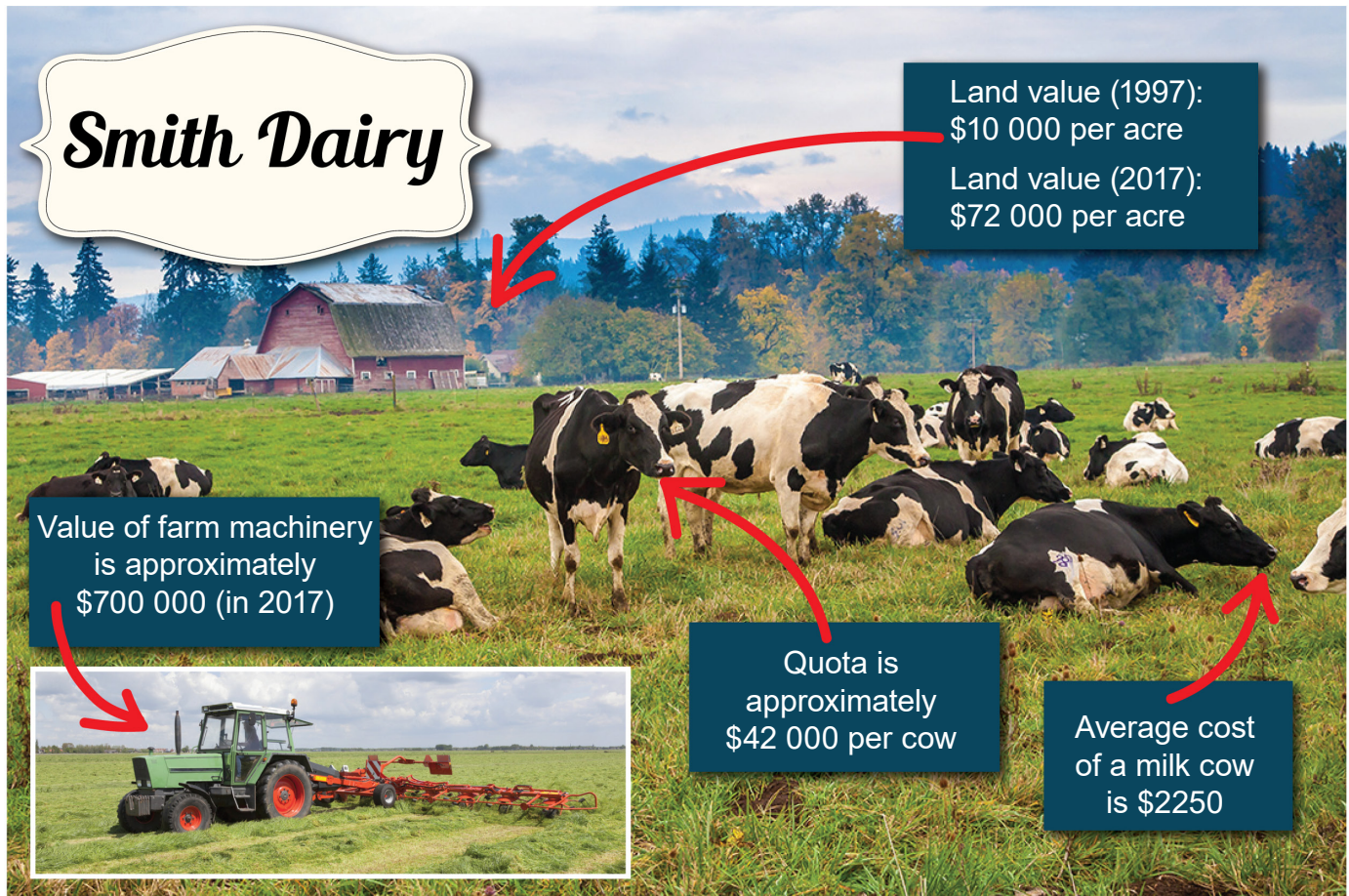
For each scenario, indicate if (a) sales and (b) profit are likely to **increase**, **decrease**, or have **no impact**.

Complete the table.

Scenario	Sales	Profit
Your ice cream supplier will give you a discount for the next two months.	<div>  </div> <div> increase decrease no impact </div>	<div>  </div> <div> increase decrease no impact </div>
Your shop's rent is going up next month.	<div>  </div> <div> increase decrease no impact </div>	<div>  </div> <div> increase decrease no impact </div>
The forecast for the summer this year is predicted to be sunny, dry, and hot.	<div>  </div> <div> increase decrease no impact </div>	<div>  </div> <div> increase decrease no impact </div>

Share: Dairy Farm

The Smith family runs a dairy farm in the Fraser Valley. Farmers purchase a license (called a *quota*) that permits them to sell a fixed volume of milk. A farmer only pays for quota once, and can be transferred to a family member or sold. The value of one quota has changed very little over time. Each cow produces about one quota of milk.



Mr. and Mrs. Smith bought their farm in 1997, which included 160 acres of land (with buildings) and 135 cows. They also bought 135 units of quota, at \$42 000 per unit.

It costs about \$5.50 per day to feed a cow. The cows are replaced as they age so that the farm's overall milk production stays constant.

Farms also use machinery. A typical farm has about \$700 000 of machinery. The machinery needs to be regularly maintained but will continually decrease in value over time.

Some costs for the farm are one-time costs, whereas other costs are ongoing.
Drag and drop each expense into the correct column.

Feed costs

Cost to purchase quota

Cost of acreage

Maintenance costs of machinery

Cost to replace animals when they no longer produce milk

One-time costs	Ongoing costs

Which expression shows the approximate total cost to feed the cows for one year?

- ☐ $\frac{5.50 \times 365}{135}$
- ☐ $5.50 \times 365 \times 135$
- ☐ $(5.50 \times 365) + 42\,000$
- ☐ $5.50(135 \times 365) + 2\,250$

Question 22

Scenario: Dairy Farm

Create an expression, in dollars, that could be used to determine the yearly replacement cost for cows if 20% of the milking herd is replaced each year.

Cost =

▼

+

−

×

÷

▼

+

−

×

÷

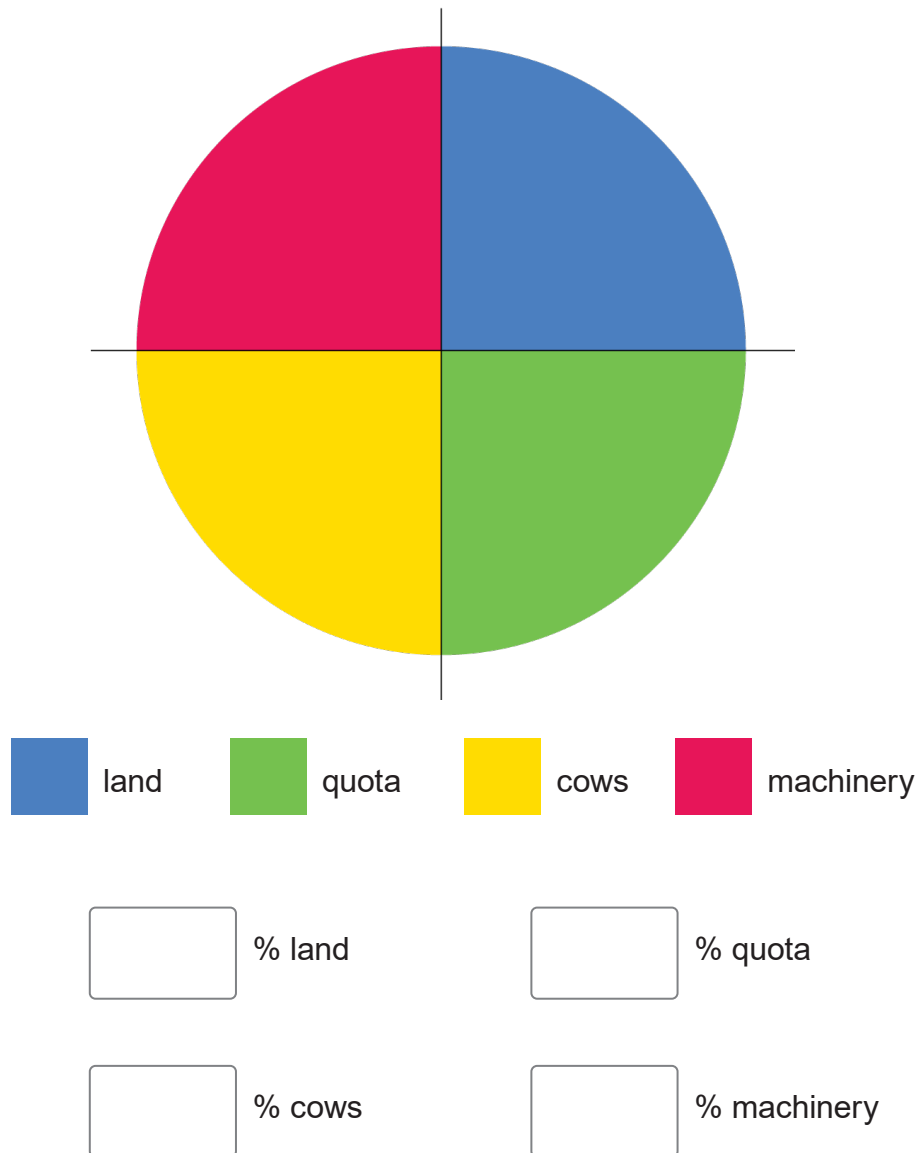
The Smiths' land increased in value between 1997 and 2017. What is the percentage increase in the value of the land?

%

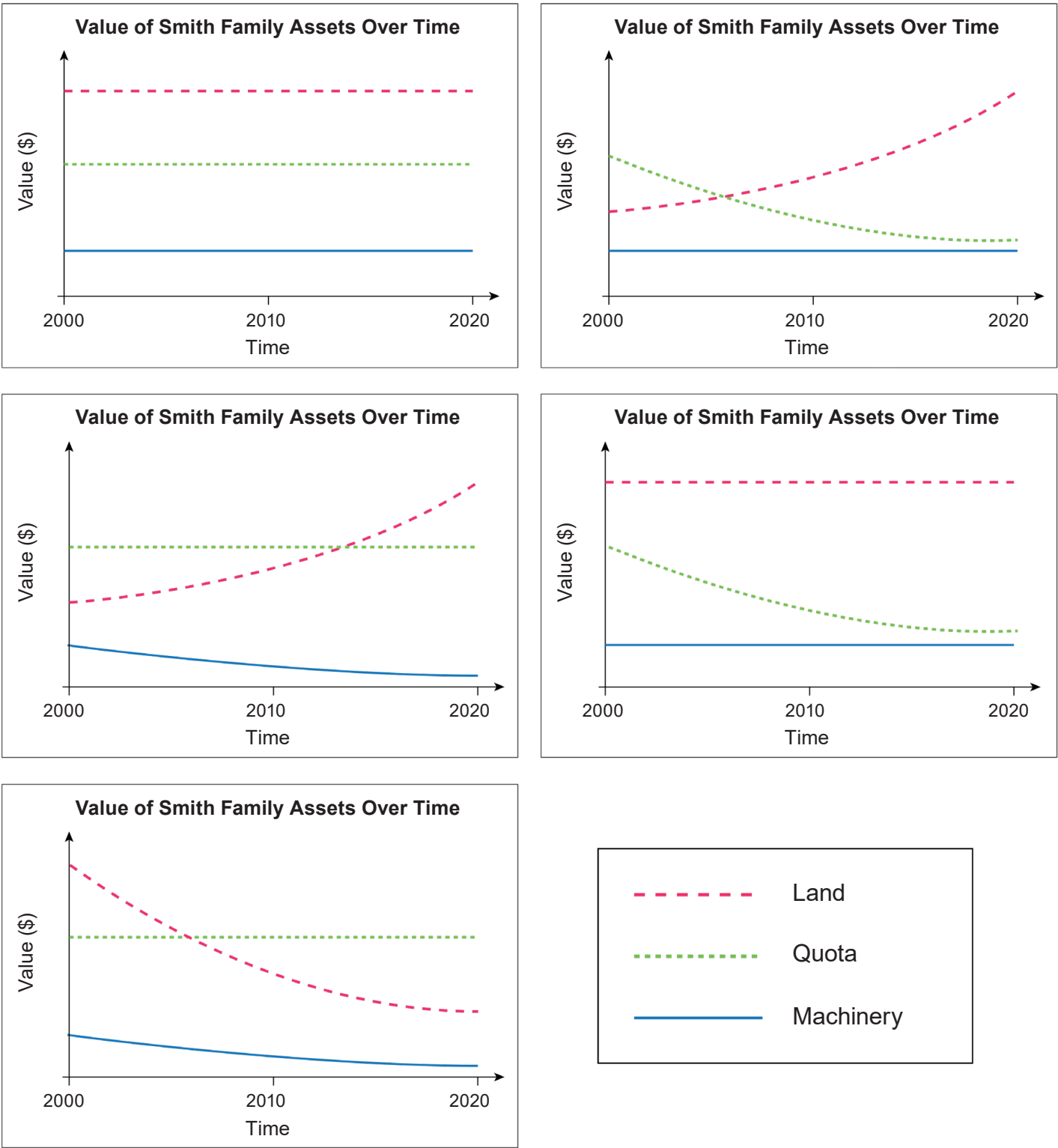
Move the lines in the graph to illustrate each portion of the total 2017 value of the Smith farm in land and buildings, quota, cows, and machinery.

Assume the Smiths have the same value of machinery as a typical farm.

Total Value of the Smith Family Farm



The Smith family wants to predict the future value of their assets. Which figure most accurately reflects the value of their assets over time?



Student Choice Section

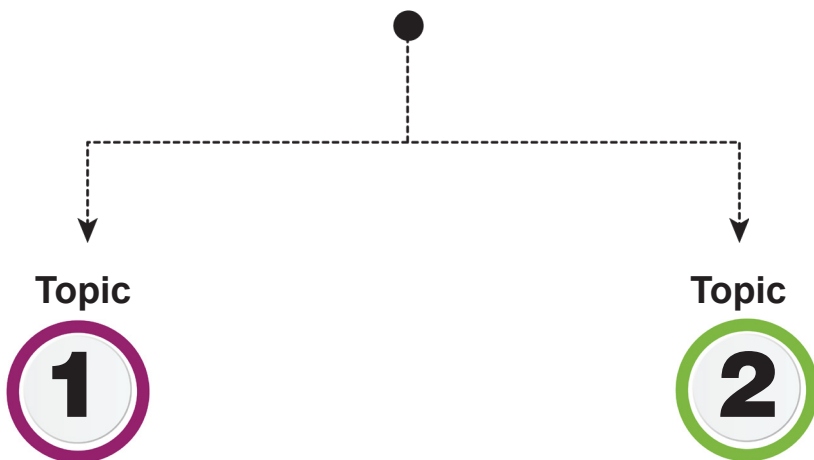


responses completed on paper response sheet

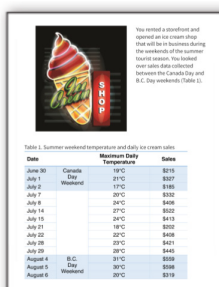
Choose the numeracy task for which you would like to complete an extensive constructed response question. These questions are a logical progression from where the tasks are headed.

Decide carefully.

You will have to complete the question you chose.



Ice Cream Shop



Use weather forecast data to predict future sales.

SELECT

Dairy Farm

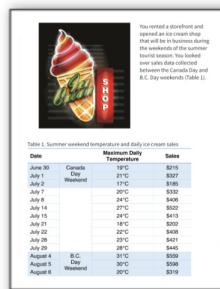


Propose a fair division of the Smiths' farm assets.

SELECT

You have chosen:

Ice Cream Shop



Use weather forecast data to predict future sales.

Question 26

Model: Ice Cream Shop

Answer this question on the indicated response sheet.

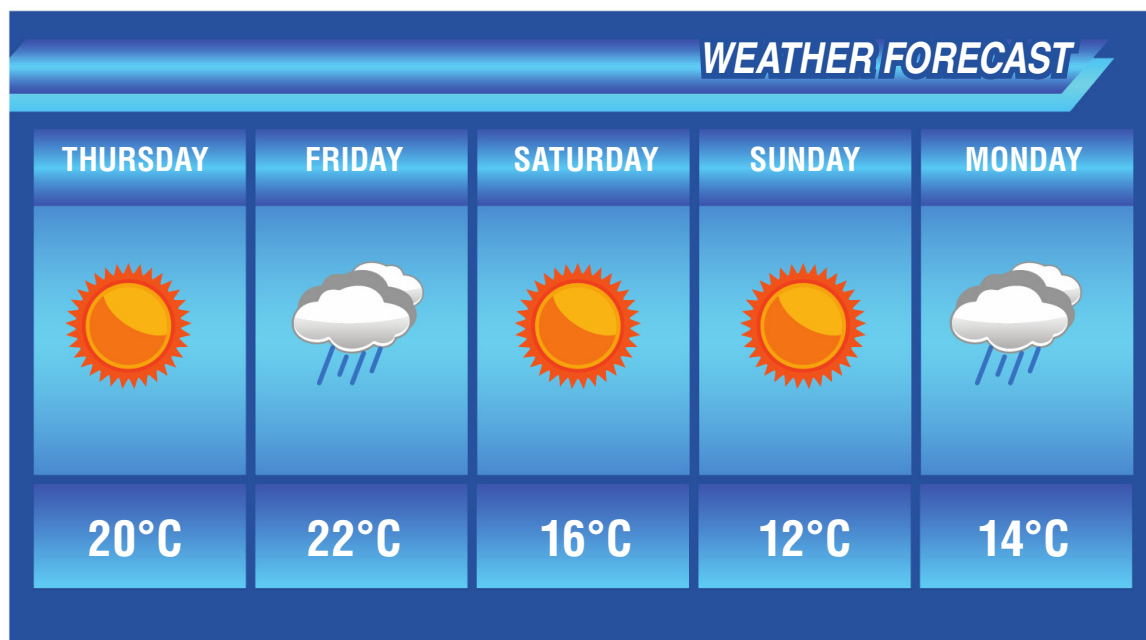
The students have returned to school, the town is seeing fewer tourists, and while it has been sunny, the forecast is rain. You will use early fall sales data to predict sales of the Thanksgiving weekend before closing for the season.

Other ice cream stores in the area experience an average 40% decrease in sales on rainy days to sunny days at the same temperature.

Graph the data in Table 2. **Using this graph and the weather forecast, predict through extrapolation and interpolation** your ice cream sales for the five days.

Table 2. Temperature and daily ice cream sales on sunny September days

Temperature (°C)	Sales (\$)
25°C	\$511
23°C	\$430
24°C	\$376
17°C	\$253
21°C	\$440
18°C	\$311
15°C	\$319
15°C	\$217



Explain and justify your solution. Be sure to include any calculations, estimations, labels, and assumptions you made.

Dairy Farm

2



Propose a fair division of the Smiths' farm assets.

Question 26

Share: Dairy Farm

Answer this question on the indicated response sheet.

In 2018, Mr. and Mrs. Smith are ready to retire and would like to share their assets with their children, Brad and Casey. The Smiths received an offer to sell their farm land and buildings at \$72 000 per acre. The buyers would also like to buy the cows, but do not need the quota nor the machinery.

Brad is not interested in farming. Casey, however, would like to start a smaller farm in a different area of the province. She would like to keep the machinery, which has a current value of \$600 000, and about 90 units of quota. The parents have indicated that the value of the farm's total assets be shared fairly between Brad, Casey, and themselves.

Propose a fair settlement. Be sure to include any calculations, estimations, labels, and assumptions you made.

Self-Reflection Component

In this part you will:

- complete 4 questions

The screenshot shows a digital form titled 'Self-Reflection Component'. It is divided into two main sections: 'Reflect on your preparation for this assessment' and 'Reflect on your work on this assessment'. Each section contains a list of four reflective questions with checkboxes. Below the second section, there is a horizontal progress bar with five segments, the first of which is highlighted in red. At the bottom, there are four small icons representing different types of assessment materials: a document, a calendar, a globe, and a map.

Reflect on your preparation for this assessment.

Select all that apply to you.

- ☐ I did the sample assessment.
- ☐ I watched the numeracy videos.
- ☐ I watched the student sample response videos.
- ☐ I met up with classmates.
- ☐ I prepared ahead of time with friends and teachers.
- ☐ While preparing, I asked for help when needed.

Reflect on your work on this assessment. Think about what you did well.

Select all that apply.

- ☐ I read each question carefully.
- ☐ I reread my answer before submitting my assessment.
- ☐ I checked our responses on paper and checked my work.
- ☐ In the student choice component, I thought carefully about my choice.

This assessment allowed me to demonstrate my ability to numeracy.

Order the four tabs from most interesting to least interesting.

Question 1

Reflect on your preparation for this assessment.

Select all the strategies that you used to prepare.

- ☐ I did the sample assessment.
- ☐ I watched the numeracy video(s).
- ☐ I reviewed the student sample responses online.
- ☐ I kept up with schoolwork.
- ☐ I prepared ahead of time with friends and teachers.
- ☐ While preparing, I asked for help when needed.

Question 2

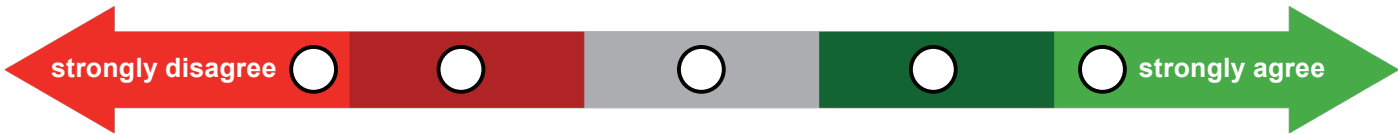
Reflect on your work on this assessment. Think about what you did well.

Select all that apply.

- ☐ I read each question carefully.
- ☐ I reviewed my answers before I submitted my assessment.
- ☐ I worked out responses on paper and checked my work.
- ☐ In the student-choice component, I thought carefully about my choice.

Question 3

This assessment allowed me to demonstrate my ability in numeracy.



Question 4

Order the four tasks from most interesting to least interesting.

