MATHWRIGHT / GRADES 8–9 / ALGEBRA

# Which Subscription Wins?

Compare two fictional streaming plans and advise three customers.

Name _____ Date _____

**FLEX**

**$6 per month**

No signup fee

**SAVER**

**$3 per month**

$24 signup fee paid once

Both plans offer the same features. The signup fee is due immediately, and each month costs the advertised rate. Use whole numbers of months throughout the activity.

**1a** Before calculating, predict which plan would cost less for a 5-month subscription and for a 12-month subscription. Explain what you noticed on the cards.

**1b** What does each customer pay before using any months? Explain what month 0 means for each plan.

# Build the cost models

Translate the pricing cards into equations and a table.

**2a** Let m be the number of months. Write an equation for the total cost of each plan. Use F for Flex and S for Saver.

**2b** In each equation, identify the rate of change and the starting value. Explain what each tells you about the plan.

**2c** Complete the table. Show your calculations for month 4.

| Months (m) | 0 | 2 | 4 | 6 | 8 | 10 | 12 |
|---|---|---|---|---|---|---|---|
| Flex ($) | | | | | | | |
| Saver ($) | | | | | | | |



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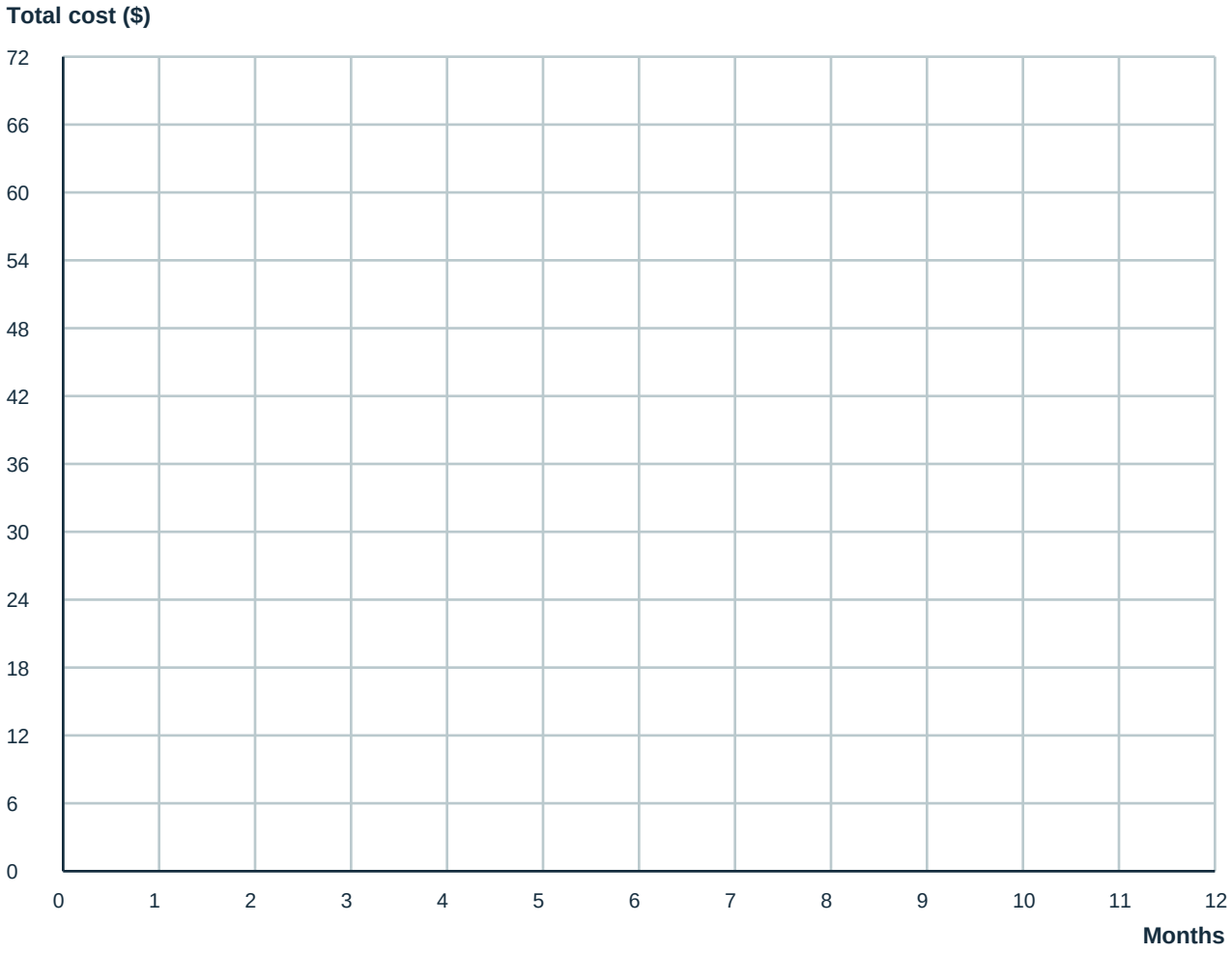
# See where the plans tie

Graph the costs and interpret the point where they meet.

3a Plot both plans using your table. Connect each set of points with a straight line as a guide and label each line.




**3b** Read the intersection as an ordered pair. What does each coordinate mean?

**3c** Where on your graph is the vertical gap between the lines largest? What does that gap mean?



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# Prove it with algebra

Use equations to check what the graph shows.

**4a** Set the two cost expressions equal and solve for m. Show each step, then substitute into both original equations to check your result.

**4b** Write and solve an inequality for the whole numbers of months when Saver is strictly cheaper. What is the first month this happens?

**4c** Explain in dollars how the difference between the two costs changes from one month to the next.



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# Audit three AI answers

Find the first incorrect statement in each sample response.

**5a** “Saver is $24 + $3m. At month 6, Saver costs $42. Flex costs $36, so Flex saves $16.”

Identify the first incorrect statement. Rewrite it and justify your correction.

**5b** “To find the tie, solve 6m = 24 + 3m. Subtract 3 from both sides to get 3m = 24. Therefore m = 8.”

Identify the first incorrect statement. Rewrite it and justify your correction.

**5c** “The plans tie at month 8. Therefore Saver is strictly cheaper for m ≥ 8.”

Identify the first incorrect statement. Rewrite it and justify your correction.



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# Make three recommendations

Match each customer to a plan and show the cost evidence.

**6a** Maya needs exactly 5 months. Which plan should she pick? Calculate both costs and how much she saves.

**6b** Leo needs exactly 12 months. Which plan should he pick? Calculate both costs and how much he saves.

**6c** Sam has $50 and wants the greatest possible number of full months. Find the maximum under each plan and recommend one. Check why one more month would exceed the budget under each plan.



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# Design a new offer

Choose a signup fee that makes the plans tie at month 10.

Saver is testing a new signup fee. Its monthly rate stays at $3. Flex still costs $6 per month with no signup fee.

**7a** Use a variable for the new signup fee. Write and solve an equation that makes the plans cost the same at month 10.

**7b** Use the new fee to calculate both costs at months 9, 10 and 11. Identify the cheaper plan or write “tie” for each month.

**7c** Write a short customer message that explains exactly which full-month lengths favor each plan and when the plans tie.



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# Models and graph

Worked solutions for student pages 1–3

## Page 1 / Predict

**1a** Sample prediction. Flex for 5 months because the signup fee matters early. Saver for 12 months because its monthly charge is $3 lower. Accept a different initial prediction with reasoning.

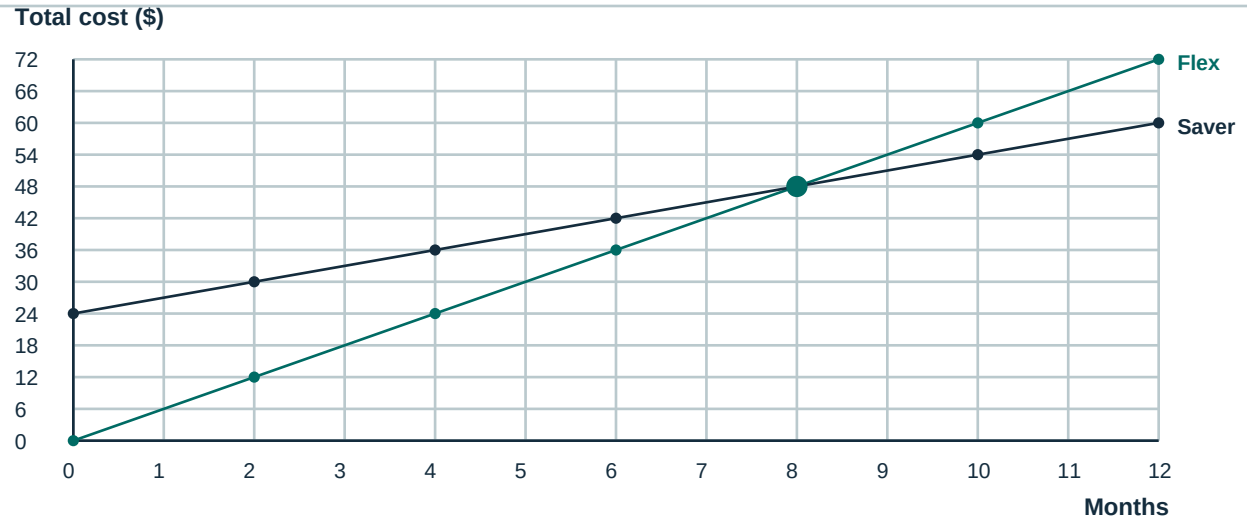
**1b** Flex costs $0 at month 0. Saver costs $24. Month 0 represents the initial charge before any monthly payments.

## Pages 2–3 / Model and graph

**2a–b** F = 6m. Flex starts at $0 and increases by $6 per month. S = 24 + 3m. Saver starts at $24 and increases by $3 per month.

**2c** At month 4, F = 6 × 4 = $24 and S = 24 + 3 × 4 = $36.

| Months (m) | 0 | 2 | 4 | 6 | 8 | 10 | 12 |
|---|---|---|---|---|---|---|---|
| Flex ($) | 0 | 12 | 24 | 36 | 48 | 60 | 72 |
| Saver ($) | 24 | 30 | 36 | 42 | 48 | 54 | 60 |




**3b** (8, 48). Both plans cost $48 for 8 months.

**3c** The gap is largest at month 0. It is $24, the Saver signup fee. The gap shrinks by $3 each month and is $0 at month 8. By month 12, Saver is $12 cheaper.



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# Proof and error analysis

Worked solutions for student pages 4–5

## Page 4 / Prove the tie

**4a** Set the costs equal and solve.

$6m = 24 + 3m$

$3m = 24$ (subtract 3m from both sides)

$m = 8$ (divide both sides by 3)

Check. $F = 6 \times 8 = \$48$ and $S = 24 + 3 \times 8 = \$48$.

**4b** $24 + 3m < 6m$, so $24 < 3m$ and $8 < m$. Saver is strictly cheaper for 9 or more full months.

**4c** F minus S equals 3m minus 24, so the signed difference increases by $3 each month. Saver closes the $24 initial gap by $3 each month, ties at month 8, then gains a $3 larger advantage each month.

## Page 5 / Audit the answers

**5a** The savings claim is the first error. The costs $42 and $36 are correct. Flex saves $42 minus $36, or $6.

**5b** “Subtract 3 from both sides” is the first error. Subtract 3m from both sides to get $3m = 24$. The stated answer $m = 8$ is correct.

**5c** The second statement is the first error. Saver is strictly cheaper for $m > 8$. At $m = 8$ the costs are equal.



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# Recommendations and design

Worked solutions for student pages 6–7

## Page 6 / Advise the customers

**6a** Maya should pick Flex. F = 6 × 5 = $30 and S = 24 + 3 × 5 = $39. Flex saves $9.

**6b** Leo should pick Saver. F = 6 × 12 = $72 and S = 24 + 3 × 12 = $60. Saver saves $12.

**6c** Flex. 6m is at most 50, so the maximum is 8 months. Eight months cost $48 and nine months cost $54.

Saver. 24 + 3m is at most 50, so 3m is at most 26. The maximum is 8 months. Eight months cost $48 and nine months cost $51.

Either plan works. Both give Sam 8 months at the same total cost.

## Page 7 / Design the fee

**7a** Let f be the new signup fee in dollars. At month 10, 6 × 10 = f + 3 × 10. So 60 = f + 30 and f = $30.

**7b**

| Months | Flex ($) | New Saver ($) | Result |
|---|---|---|---|
| 9 | 54 | 57 | Flex |
| 10 | 60 | 60 | Tie |
| 11 | 66 | 63 | New Saver |

**7c** Sample message. Flex costs less for 1 to 9 full months. The plans tie at $60 for 10 months. The new Saver offer costs less for 11 or more full months.



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