

# Example Items

## Mathematical Models w/Applications

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**Example Items** are a **representative set** of items for the ACP. Teachers may use this set of items along with the test blueprint as guides to prepare students for the ACP. On the last page, the correct answer, content SE and SE justification are listed for each item.

*The specific part of an SE that an Example Item measures is **NOT** necessarily the only part of the SE that is assessed on the ACP.* None of these Example Items will appear on the ACP.

Teachers may provide feedback regarding Example Items.

(1) Download the [Example Feedback Form](#) and email it. The form is located on the homepage of the Assessment website ([assessment.dallasisd.org](http://assessment.dallasisd.org)).

OR

(2) To submit directly: Login to the [Assessment website](#). Under “News” in the left-hand column, click on “Sem 2 Example Items Download.” Above the subjects, click on “Example Feedback Form.”

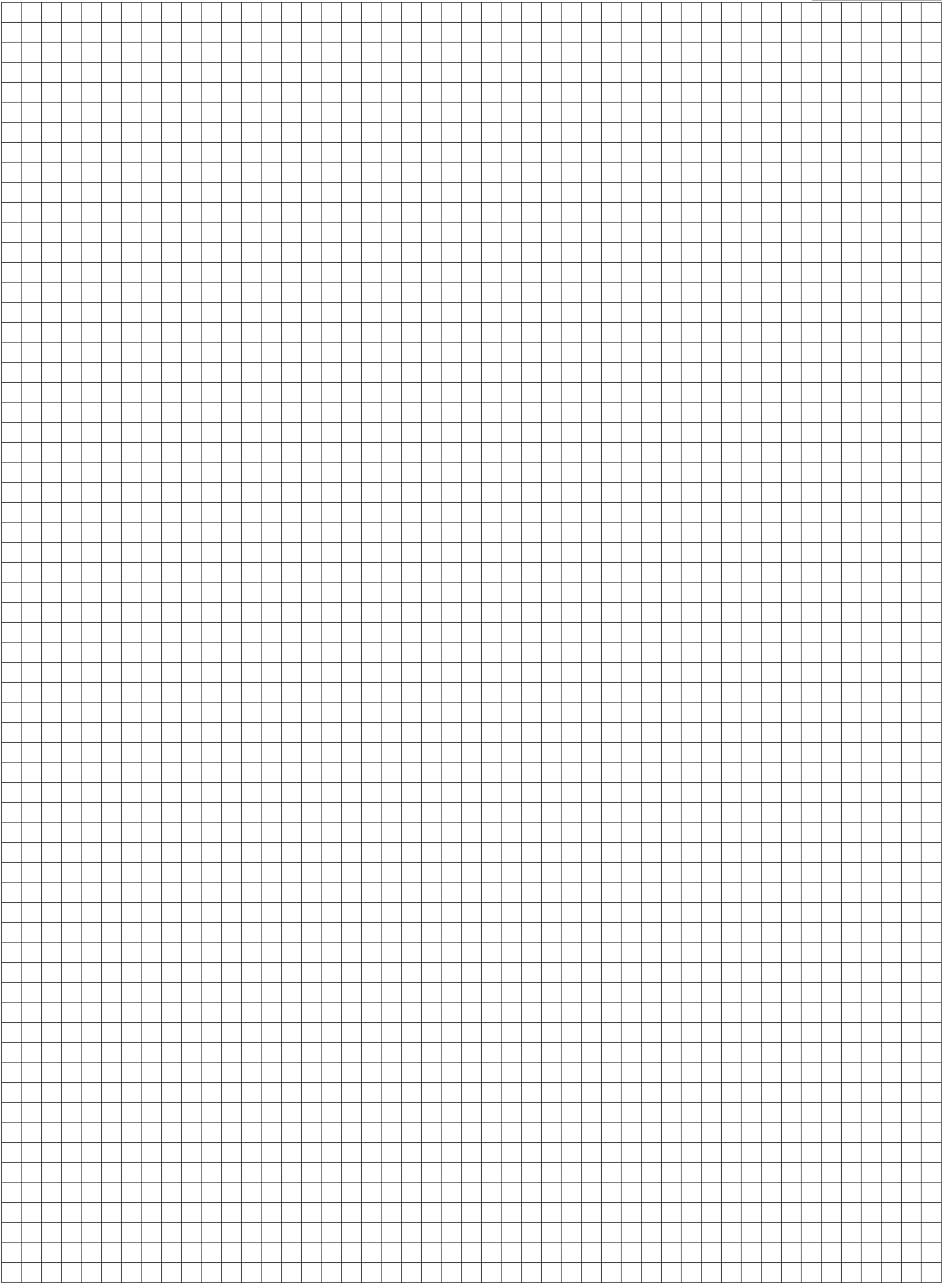
Second Semester  
2017–2018  
Code #: 1311

ACP Formulas  
Mathematical Models with Applications  
2017-2018

<b>Perimeter and Circumference</b>	
Square: $P = 4s$	Circle: $C = 2\pi r$ $C = \pi d$
Rectangle: $P = 2\ell + 2w$	
<b>Area</b>	
Square: $A = s^2$	Triangle: $A = \frac{1}{2}bh$
Rectangle: $A = \ell w$ $A = bh$	Regular Polygon: $A = \frac{1}{2}aP$
Parallelogram: $A = bh$	Trapezoid: $A = \frac{1}{2}(b_1 + b_2)h$
Rhombus: $A = \frac{1}{2}d_1d_2$ $A = bh$	Circle: $A = \pi r^2$
<b>Lateral Surface Area</b>	
Prism: $L = Ph$	Pyramid: $L = \frac{1}{2}P\ell$
Cylinder: $L = 2\pi rh$	Cone: $L = \pi r\ell$
<b>Total Surface Area</b>	
Prism: $S = Ph + 2B$	Pyramid: $S = \frac{1}{2}P\ell + B$
Cylinder: $S = 2\pi rh + 2\pi r^2$	Cone: $S = \pi r\ell + \pi r^2$
Sphere: $S = 4\pi r^2$	
<b>Volume</b>	
Rectangular Prism: $V = \ell wh$	Cube: $V = s^3$
Prism: $V = Bh$	Pyramid: $V = \frac{1}{3}Bh$
Cylinder: $V = \pi r^2 h$ $V = Bh$	Cone: $V = \frac{1}{3}Bh$ $V = \frac{1}{3}\pi r^2 h$
Sphere: $V = \frac{4}{3}\pi r^3$	
<b>Probability</b>	
Binomial Probability: $P(x) = \binom{n}{x} p^x q^{n-x}$	Geometric Probability: $P(n = x) = q^{n-1} \cdot p$
Permutations: ${}_n P_r = \frac{n!}{(n-r)!}$	Combinations: ${}_n C_r = \frac{n!}{(n-r)!r!}$
Binomial Coefficients: $\binom{n}{r} = {}_n C_r$	

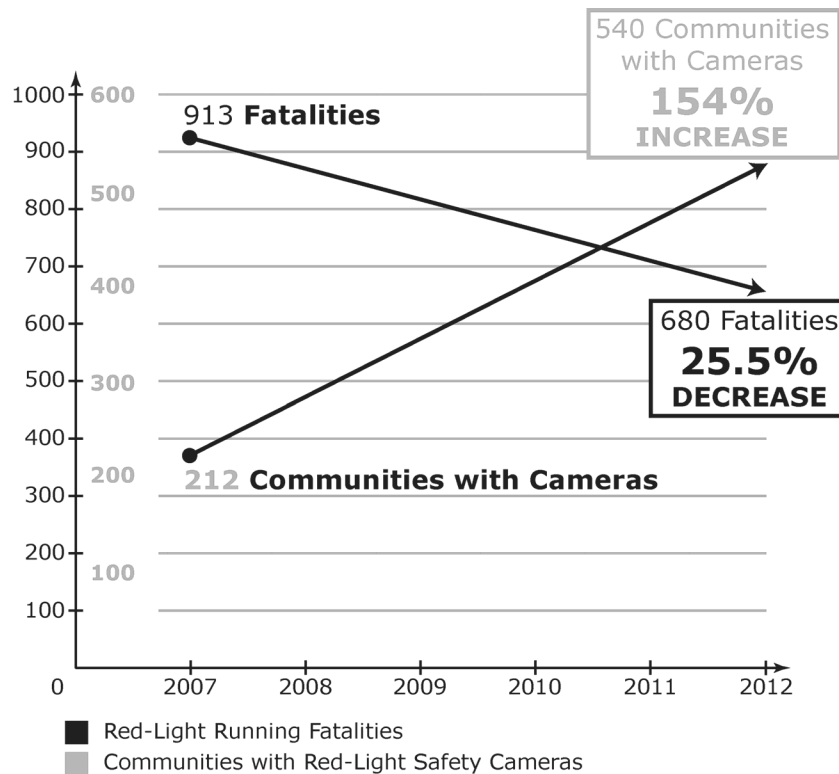
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<b>Coordinate Geometry</b>	
Midpoint: $M = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$	Distance: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$
Slope of a Line: $m = \frac{y_2 - y_1}{x_2 - x_1}$	$m = \frac{\Delta y}{\Delta x}$
Slope-Intercept Form of a Line:	$y = mx + b$
Point-Slope Form of a Line:	$y - y_1 = m(x - x_1)$
Standard Form of a Line:	$Ax + By = C$
Quadratic Equation: $ax^2 + bx + c = 0$	Quadratic Formula: $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Equation of a Circle:	$(x - h)^2 + (y - k)^2 = r^2$
<b>Trigonometry</b>	
Pythagorean Theorem: $a^2 + b^2 = c^2$	
Special Right Triangles:	$30^\circ - 60^\circ - 90^\circ$ $x, x\sqrt{3}, 2x$ $45^\circ - 45^\circ - 90^\circ$ $x, x, x\sqrt{2}$
Trigonometric Ratios: $\sin \theta = \frac{\text{opp}}{\text{hyp}}$	$\cos \theta = \frac{\text{adj}}{\text{hyp}}$ $\tan \theta = \frac{\text{opp}}{\text{adj}}$
To Convert Degrees to Radians, Multiply by: $\frac{\pi \text{ radians}}{180^\circ}$	To Convert Radians to Degrees, Multiply by: $\frac{180^\circ}{\pi \text{ radians}}$
<b>Personal Finance</b>	
Simple Interest: $I = prt$	Present Value: $PV = \frac{FV}{\left(1 + \frac{r}{n}\right)^{nt}}$
Compound Interest: $A = P \left(1 + \frac{r}{n}\right)^{nt}$	Future Value: $FV = A \frac{(1 + r)^t - 1}{r}$
Future Value of Ordinary Annuity:	$FV = P \cdot \frac{(1 + i)^N - 1}{i}$
Future Value of an Annuity Due:	$FV = P \cdot \frac{(1 + i)^N - 1}{i} \cdot (1 + i)$
Amortization Payment:	$Amt = PV \cdot \frac{i}{1 - (1 + i)^{-N}}$
Annual Percentage Rate:	$APR = \frac{72i}{3P(n + 1) + i(n - 1)}$



## EXAMPLE ITEMS Math Models, Sem 2

- 1 The National Coalition for Safer Roads gathered data on the number of communities that installed red-light safety cameras and the number of fatalities in those communities. The data are shown in the graph.



The graph implies that red-light safety cameras prevent fatalities. Which additional information is needed in order to justify this conclusion?

- A Speed limits were lower in communities with red-light cameras.
- B The communities surveyed for cameras were the same as the communities surveyed for fatalities.
- C The average amount of red-light running fines was higher in communities with red-light cameras.
- D Fatalities included injuries or conditions that occurred prior to the red-light incident.

- 2 Connie wanted to find the average price of gasoline in her city. She sampled the prices of regular gasoline at 75 of the 325 gas stations. The sample average cost was \$2.79 per gallon. Of the sampled gas stations, 35 sold gasoline for more than \$2.79 per gallon. Approximately what percent of sampled gas stations sold gasoline for more than the sample average cost?

- A 11%
- B 23%
- C 47%
- D 77%

## EXAMPLE ITEMS Math Models, Sem 2

**3** Donatello has \$5,000 to invest for 10 years. He is considering the two options shown.

**Option 1:** A CD that pays 6.25% compounded annually.

**Option 2:** A savings account that pays 6% compounded quarterly.

How much more will Donatello earn if he invests in option 1?

- A \$97.59
- B \$128.52
- C \$213.44
- D \$216.11

**4** The table shows the charges for four health insurance plans.

Option	Monthly Premium	Office Visit Copay	Prescription Copay
A	\$300	\$50	\$40
B	\$325	\$35	\$15
C	\$450	\$10	\$10
D	\$475	\$0	\$0

According to the table, which option costs the least for 6 months if there are 8 doctor visits and 3 prescriptions?

- A Option A
- B Option B
- C Option C
- D Option D

**5** Sam teaches in a public school district where employees may choose to have Social Security taxes withheld from their paycheck at a rate of 6.2% or pay into a retirement fund instead. Sam chose the retirement fund and found on his paycheck that \$125.75 was deducted from his gross pay of \$2,166.50. Did Sam choose the least expensive deduction plan?

- A No, he would have had \$8.57 less deducted for Social Security.
- B No, the retirement fund deduction is a higher percentage of his salary than Social Security.
- C Yes, the retirement fund deduction is \$125 less than what would have been deducted for Social Security.
- D Yes, the retirement fund deduction is only 5.8% of his salary.

# EXAMPLE ITEMS Math Models, Sem 2

6 The data shown represents the scores from a recent test in Mrs. Prescott's math class.

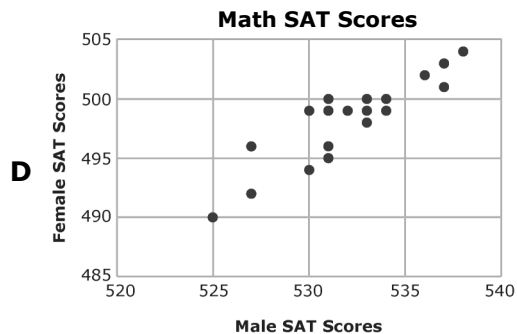
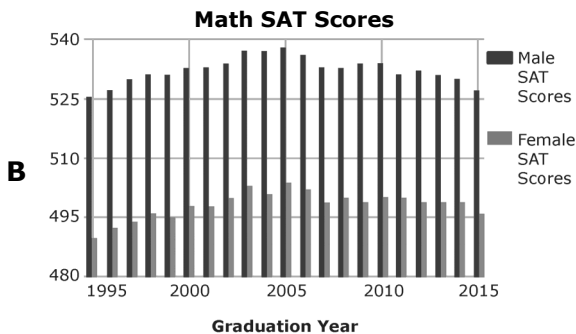
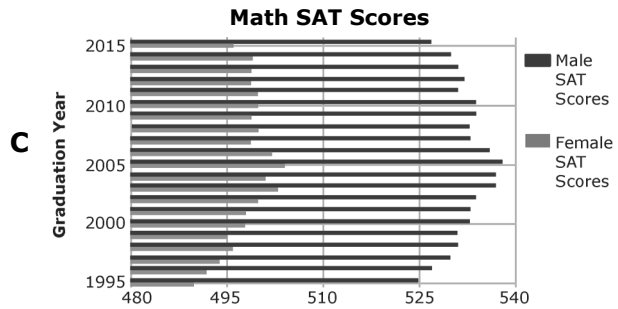
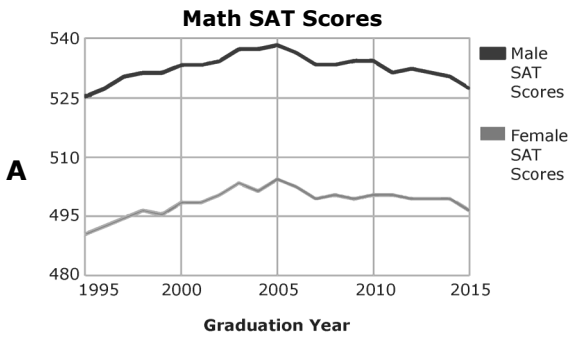
54	56	60	64	68	68	70	71	72	75	75	76
78	80	84	88	90	92	94	95	96	98	100	100

What is the interquartile range (IQR) of the test scores?

+	•	•	•	•	•	•	•
-	0	0	0	0	0	0	0
	1	1	1	1	1	1	1
	2	2	2	2	2	2	2
	3	3	3	3	3	3	3
	4	4	4	4	4	4	4
	5	5	5	5	5	5	5
	6	6	6	6	6	6	6
	7	7	7	7	7	7	7
	8	8	8	8	8	8	8
	9	9	9	9	9	9	9

Record the answer and fill in the bubbles on the grid provided. Be sure to use the correct place value.

7 Math SAT scores for the past 20 years show an overall increase for graduating seniors going to college. Which graph does **not** support the conclusion that Math SAT scores increased over the past 20 years?



## EXAMPLE ITEMS Math Models, Sem 2

**8** The sports, academics, and fine arts teams at a local high school performed very well last year. Together, they won a total of 12 first-place trophies. There is only space to display 5 trophies at the front of the school. If the order does not matter, how many different ways can the trophies be displayed?

- A 60
- B 120
- C 792
- D 95,040

**9** Karen is conducting an experiment that involves flipping a fair coin. She wants to know the probability of getting exactly 4 tails when flipping the coin 6 times. Which calculation does Karen use to determine the theoretical probability of getting exactly 4 tails when the coin is flipped 6 times?

- A  ${}_6C_4 \cdot 0.5^4 \cdot 0.5^2$
- B  $0.5^4 \cdot 0.5^2$
- C  $\frac{4}{6} \cdot \frac{2}{6}$
- D  $\frac{4}{6} + \frac{2}{6}$

**10** There are 5 squares, 8 triangles and 2 circles in a box. John draws 3 shapes from the box, records the result in a table, and places the shapes back in the box. Which table shows data that is equivalent to the theoretical probability of drawing each shape?

**A**

Outcome	Square	Triangle	Circle
Frequency	5	6	4

**B**

Outcome	Square	Triangle	Circle
Frequency	6	10	2

**C**

Outcome	Square	Triangle	Circle
Frequency	8	8	8

**D**

Outcome	Square	Triangle	Circle
Frequency	10	16	4



## EXAMPLE ITEMS Math Models, Sem 2

11

A house valued at \$120,000 can be financed with monthly payments of \$800 for a 30 year term. The same house can be rented for \$946 per month. After 30 years, how much more would be paid for renting than for financing?

Record the answer and fill in the bubbles on the grid provided. Be sure to use the correct place value.

+	0	0	0	0	0	0	0
-	1	1	1	1	1	1	1
	2	2	2	2	2	2	2
	3	3	3	3	3	3	3
	4	4	4	4	4	4	4
	5	5	5	5	5	5	5
	6	6	6	6	6	6	6
	7	7	7	7	7	7	7
	8	8	8	8	8	8	8
	9	9	9	9	9	9	9

12

Luke is going to finance a purchase of \$700 at a local department store. The annual interest rate is 18% with monthly payments. Luke must choose whether to finance the purchase for 6, 12, 18, or 24 months. Which table correctly represents the amortization payments for the various number of months?

A

<b>Number of Months</b>	6	12	18	24
<b>Monthly Payment</b>	\$116.67	\$58.33	\$38.89	\$29.17

B

<b>Number of Months</b>	6	12	18	24
<b>Monthly Payment</b>	\$122.87	\$64.18	\$44.66	\$34.95

C

<b>Number of Months</b>	6	12	18	24
<b>Monthly Payment</b>	\$137.67	\$68.83	\$45.89	\$34.42

D

<b>Number of Months</b>	6	12	18	24
<b>Monthly Payment</b>	\$212.80	\$64.69	\$19.67	\$5.98

**EXAMPLE ITEMS Math Models Key, Sem 2**

<b>Item#</b>	<b>Key</b>	<b>SE</b>	<b>SE Justification</b>
<b>1</b>	B	M.9E	Analyze marketing claims based on graphs and statistics from print media and justify the validity of stated or implied conclusions.
<b>2</b>	C	M.9D	Use data from a sample to estimate population proportion.
<b>3</b>	A	M.4C	Analyze types of savings options involving compound interest.
<b>4</b>	B	M.4A	Analyze and compare coverage options and rates in insurance.
<b>5</b>	D	M.4B	Investigate and compare investment options, including retirement plans.
<b>6</b>	24	M.9B	Analyze numerical data using variability (-interquartile range or IQR-).
<b>7</b>	D	M.9A	Interpret information from various graphs, including line graphs, bar graphs, histograms, [and] scatterplots to draw conclusions from the data.
<b>8</b>	C	M.8A	Determine the number of ways an event may occur using combinations.
<b>9</b>	A	M.8C	Determine the reasonableness of a theoretical model.
<b>10</b>	D	M.8B	Compare theoretical to empirical probability.
<b>11</b>	52560	M.3C	Compare buying a home to renting a home.
<b>12</b>	B	M.3A	Use formulas to generate tables to display series of payments for loan amortizations resulting from financed purchases.