The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA II (Common Core)

Friday, January 27, 2017 — 9:15 a.m. to 12:15 p.m.

MODEL RESPONSE SET

Table of Contents

Question 25

25 Express $(1 - i)^3$ in $a + bi$ form.

$(1-i)(1-i)(1-i)$

$(1-i-i+i^2)(1-i)$

$(1-2i+-1)(1-i)$

$(-2i)(1-i)$

$-2i+2i^2$

$-2i-2$

$-2-2i$

Score 2: The student gave a complete and correct response.

Question 25

25 Express $(1 - i)^3$ in $a + bi$ form.

$-2-2i$

$i^1 - i$

$i^2 = -1$

$i^3 = -i$

$i^4 = 1$

$1^3 = 1$

Score 2: The student gave a complete and correct response.

Question 25

25 Express $(1 - i)^3$ in $a + bi$ form.

$(1-i)(1-i)^2$

$(1-i)(1-2i+i^2)$

$(1-i)(-2i)$

$\boxed{-2i-2}$

Score 2: The student gave a complete and correct response.

Question 25

25 Express $(1 - i)^3$ in $a + bi$ form.

$(1-i)(1-i)(1-i)$

$(1-i-i+i^2)(1-i)$

$1-i-i+i^2-i+i^2+i^2-i^3$

$-i^3+3i^2-3i+1$

Score 1: The student did not simplify powers of i.

Question 25

25 Express $(1 - i)^3$ in $a + bi$ form.

$_3C_0\ (1)^3(-i)^0 = 1 +$

$_3C_1\ (1)^2(-i)^1 = -3i +$

$_3C_2\ (1)^1(-i)^2 = 3 +$

$_3C_3\ (1)^0(-i)^3 = i$

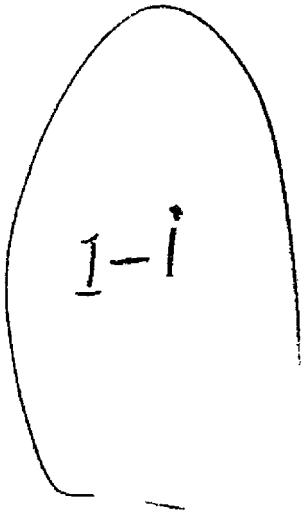
$1 - 3i + 3 + i$

$4 - 2i$

Score 1: The student made one computational error.

Question 25

25 Express $(1 - i)^3$ in $a + bi$ form.



Score 0: The student gave a completely incorrect response.

Question 25

25 Express $(1 - i)^3$ in $a + bi$ form.

$(1-i)^2(1-i)$

$(1+i^2)(1-i)$

$1 - i + i^2 - i^3$

$+ -i \quad -1 \quad -i$

$-2i$

Score 0: The student made multiple errors.

Question 26

26 An orange-juice processing plant receives a truckload of oranges. The quality control team randomly chooses three pails of oranges, each containing 50 oranges, from the truckload. Identify the sample and the population in the given scenario.

The population is the truckload of oranges

The sample are the oranges in the pails

State *one* conclusion that the quality control team could make about the population if 5% of the sample was found to be unsatisfactory.

It's pretty likely that most of the oranges are satisfactory.

Score 2: The student gave a complete and correct response.

Question 26

26 An orange-juice processing plant receives a truckload of oranges. The quality control team randomly chooses three pails of oranges, each containing 50 oranges, from the truckload. Identify the sample and the population in the given scenario.

Sample = 3 pails of 50 oranges
population = truckload

State *one* conclusion that the quality control team could make about the population if 5% of the sample was found to be unsatisfactory.

Some of the population may also be unsatisfactory.

Score 2: The student gave a complete and correct response.

Question 26

26 An orange-juice processing plant receives a truckload of oranges. The quality control team randomly chooses three pails of oranges, each containing 50 oranges, from the truckload. Identify the sample and the population in the given scenario.

Sample: 50 oranges
Population: 3 pails

State *one* conclusion that the quality control team could make about the population if 5% of the sample was found to be unsatisfactory.

It is likely that approximately 5% of all the oranges are unsatisfactory.

Score 1: The student only stated a correct conclusion.

Question 26

26 An orange-juice processing plant receives a truckload of oranges. The quality control team randomly chooses three pails of oranges, each containing 50 oranges, from the truckload. Identify the sample and the population in the given scenario.

the population is 50 oranges
and the sample is 3 pails

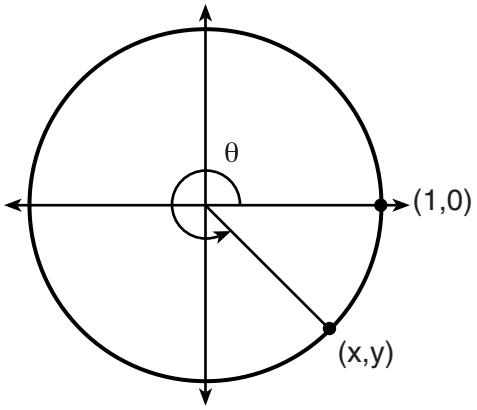
State *one* conclusion that the quality control team could make about the population if 5% of the sample was found to be unsatisfactory.

95% of the population is satisfactory

Score 0: The student only identified the sample correctly.

Question 27

27 Using the unit circle below, explain why $\csc\theta = \frac{1}{y}$.

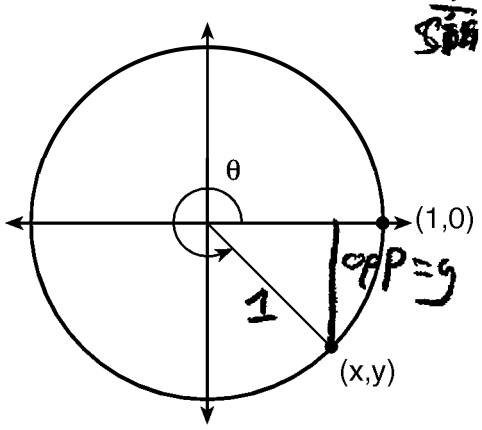


cscθ is equal to $\frac{1}{\sin\theta}$, and sinθ on a unit circle (with radius=1) is equal to the y value of the point. so, if sinθ=y and $\csc\theta = \frac{1}{\sin\theta}$ it is also true to say $\csc\theta = \frac{1}{y}$.

Score 2: The student gave a complete and correct response.

Question 27

27 Using the unit circle below, explain why $\csc\theta = \frac{1}{y}$.



$\csc = \frac{h}{o}$

$\frac{1}{\sin\theta} = \frac{h}{o}$

opp = y

$\csc\theta = \frac{1}{y}$ because on the unit circle the hypotenuse is always 1 and y is the opposite leg.

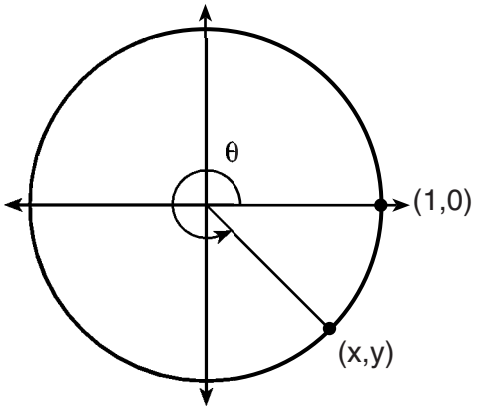
$\csc\theta = \frac{hyp}{opp}$.

Score 2: The student gave a complete and correct response.

Question 27

27 Using the unit circle below, explain why $\csc\theta = \frac{1}{y}$.

$\csc = \frac{1}{\sin}$



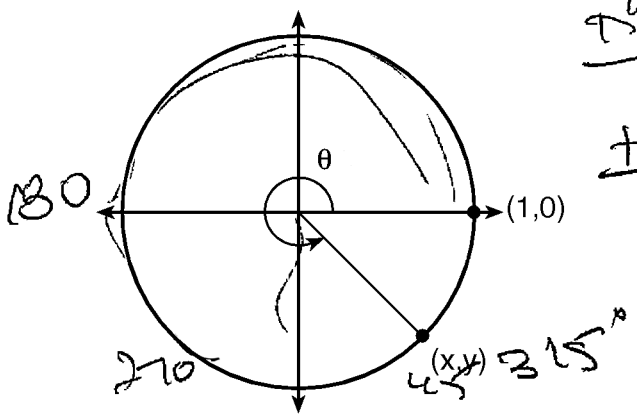
$\sin\theta = \frac{y}{1} = y$

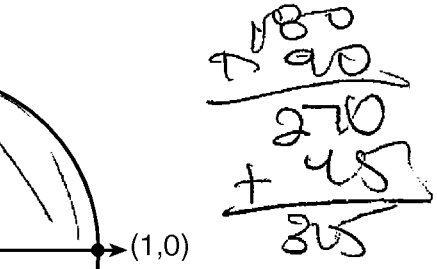
$\csc = \frac{1}{\sin} = \frac{1}{y}$

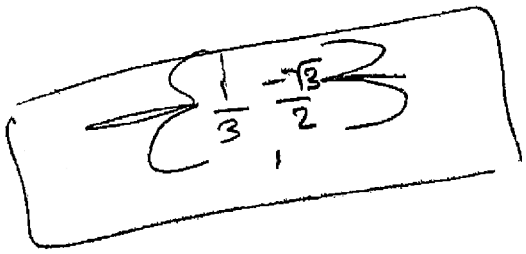
Score 1: The student did not write an explanation.

Question 27

27 Using the unit circle below, explain why $\csc\theta = \frac{1}{y}$.







(I tried)

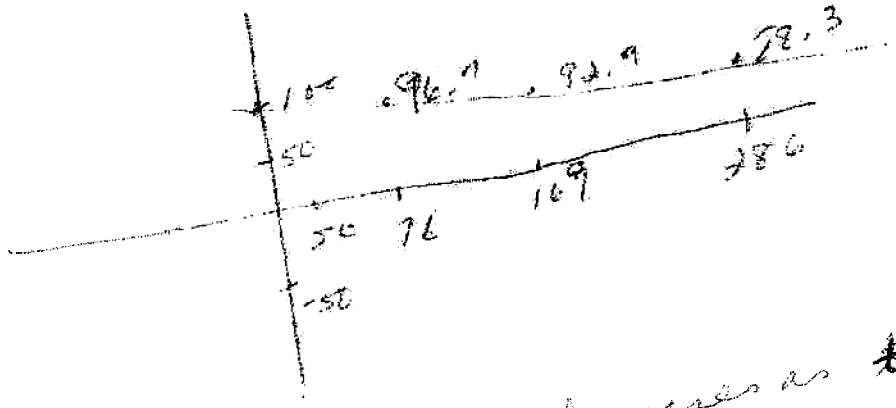
Score 0: The student showed no appropriate work and did not write an explanation.

Question 28

28 The function $M(t)$ represents the mass of radium over time, t, in years.

$$M(t) = 100e^{\frac{\left(ln\frac{1}{2}\right)t}{1590}}$$

Determine if the function $M(t)$ represents growth or decay. Explain your reasoning.



The graph decreases as t increases

$M(t)$ decays

Score 2: The student gave a complete and correct response.

Question 28

28 The function $M(t)$ represents the mass of radium over time, t, in years.

$$M(t) = 100e^{\frac{\left(ln\frac{1}{2}\right)t}{1590}}$$

Determine if the function $M(t)$ represents growth or decay. Explain your reasoning.

Decay

$\ln .5 \approx -.6931$

when $t \geq 0$, $\frac{(\ln .5)t}{1590}$ will be negative.

Therefore, the exponent will be negative, representing exponential decay

Score 2: The student gave a complete and correct response.

Question 28

28 The function $M(t)$ represents the mass of radium over time, t, in years.

$$M(t) = 100e^{\frac{\left(ln\frac{1}{2}\right)t}{1590}}$$

Determine if the function $M(t)$ represents growth or decay. Explain your reasoning.

Decay because the $\frac{1}{2}$ signifys that it is decay, not growth.

Score 1: The student gave an incomplete explanation.

Question 28

28 The function $M(t)$ represents the mass of radium over time, t, in years.

$$M(t) = 100e^{\frac{\left(ln\frac{1}{2}\right)t}{1590}}$$

Determine if the function $M(t)$ represents growth or decay. Explain your reasoning.

$100e^{\frac{\left(\ln\frac{1}{2}\right)\cdot 2}{1590}} = 99.91$

$100e^{\frac{\left(\ln\frac{1}{2}\right)\cdot 6}{1590}} = 99.738$

decay

Score 1: The student showed appropriate work, but did not write an explanation.

Question 28

28 The function $M(t)$ represents the mass of radium over time, t, in years.

$$M(t) = 100e^{\frac{\left(ln\frac{1}{2}\right)t}{1590}}$$

Determine if the function $M(t)$ represents growth or decay. Explain your reasoning.

Decay!

Score 0: The student did not write an explanation.

Question 28

28 The function $M(t)$ represents the mass of radium over time, t, in years.

$$M(t) = 100e^{\frac{\left(ln\frac{1}{2}\right)t}{1590}}$$

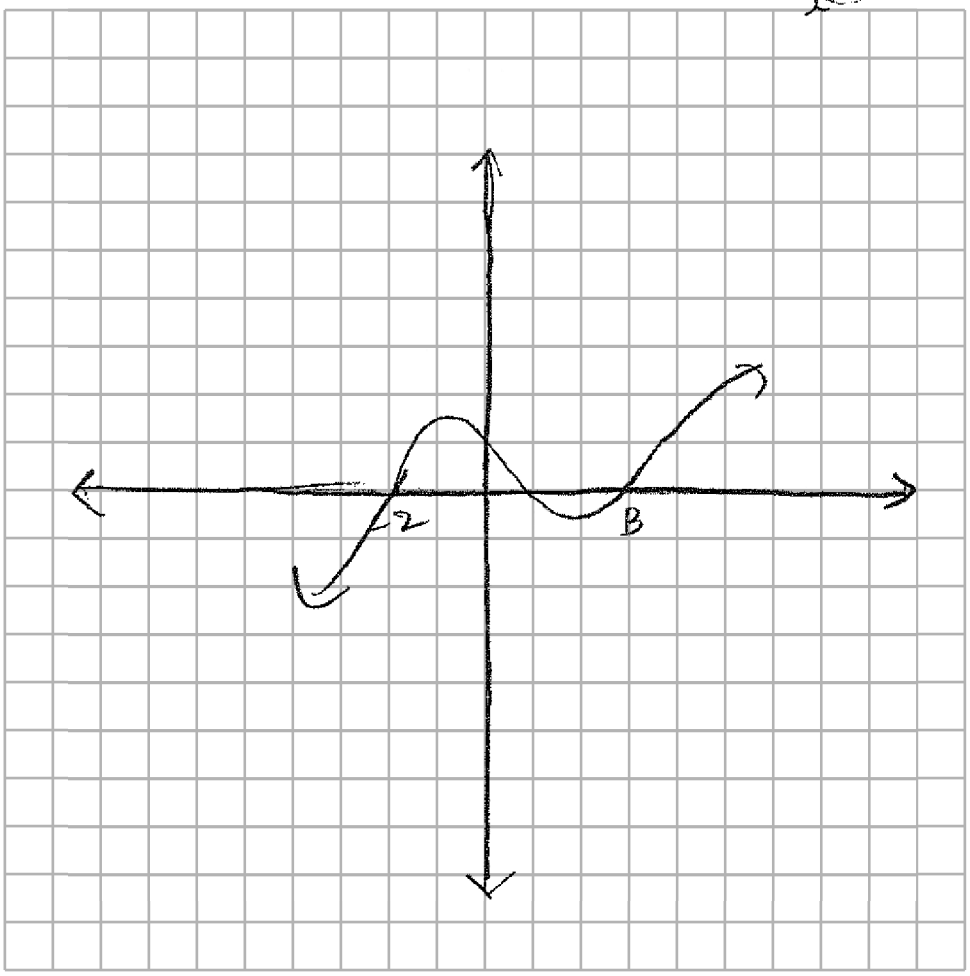
Determine if the function $M(t)$ represents growth or decay. Explain your reasoning.

$M(t) = 100e^{\frac{\left(\ln\frac{1}{2}\right)t}{1590}}$ decay of .05

Score 0: The student showed no appropriate work and did not write an explanation.

Question 29

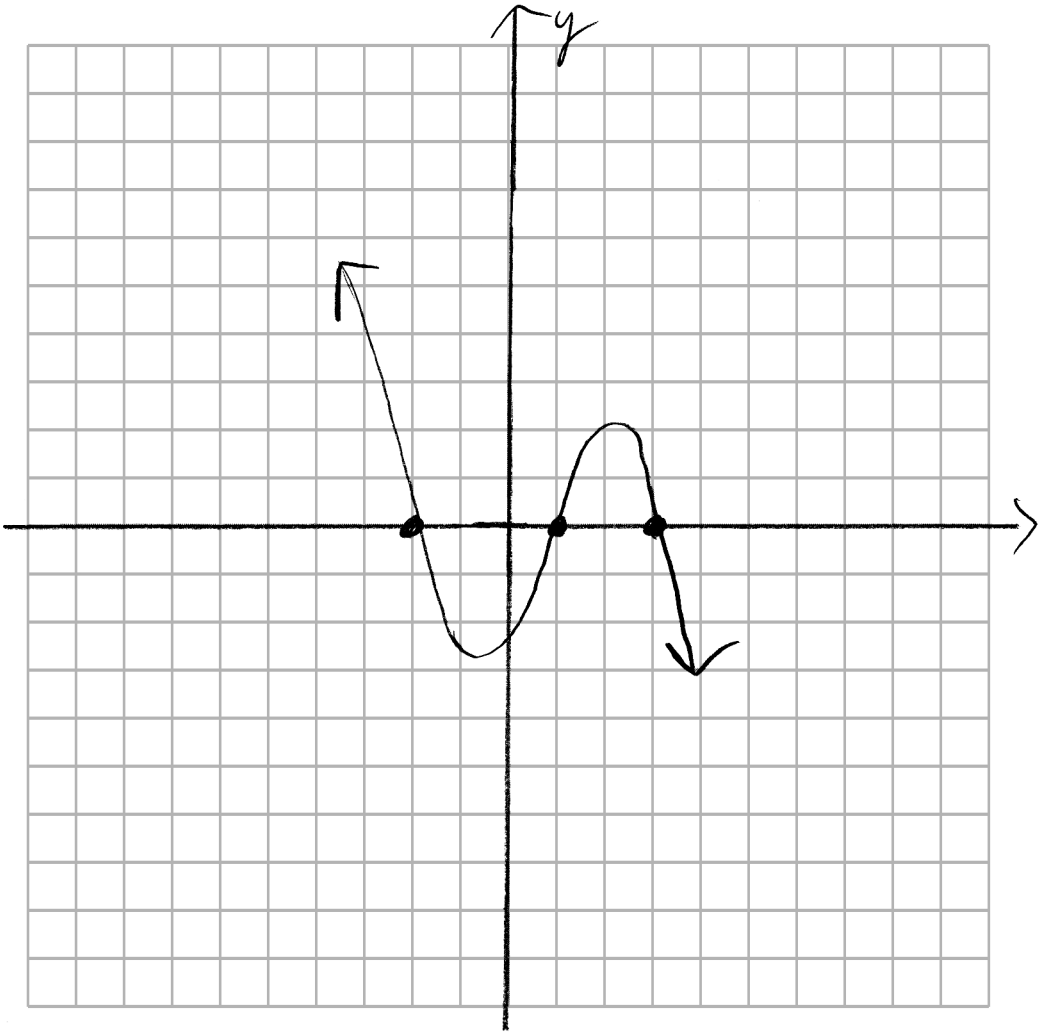
29 On the grid below, sketch a ~~cubic polynomial whose~~ zeros are 1, 3, and −2.



Score 2: The student gave a correct sketch.

Question 29

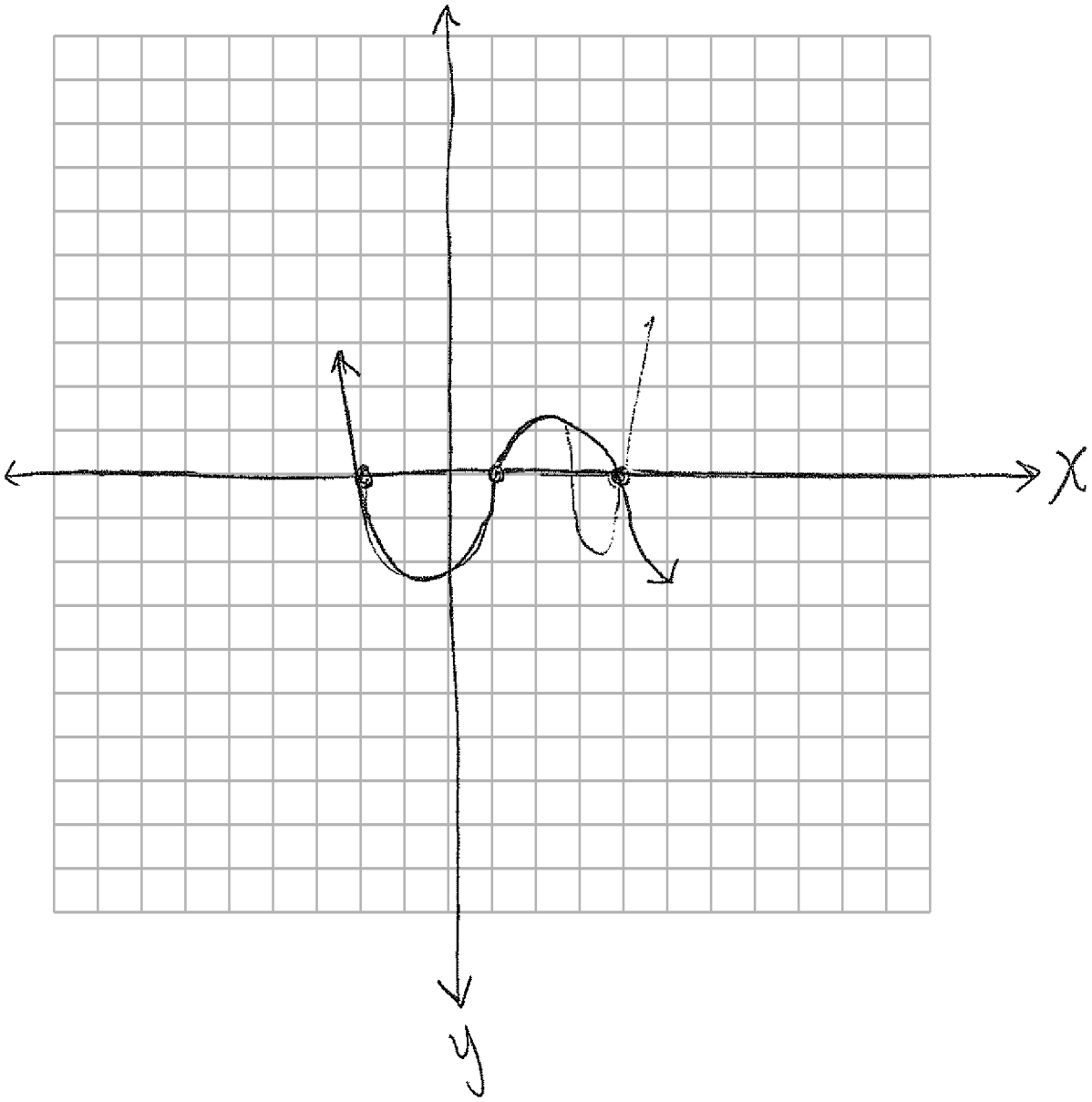
29 On the grid below, sketch a cubic polynomial whose zeros are 1, 3, and −2.



Score 2: The student gave a correct sketch.

Question 29

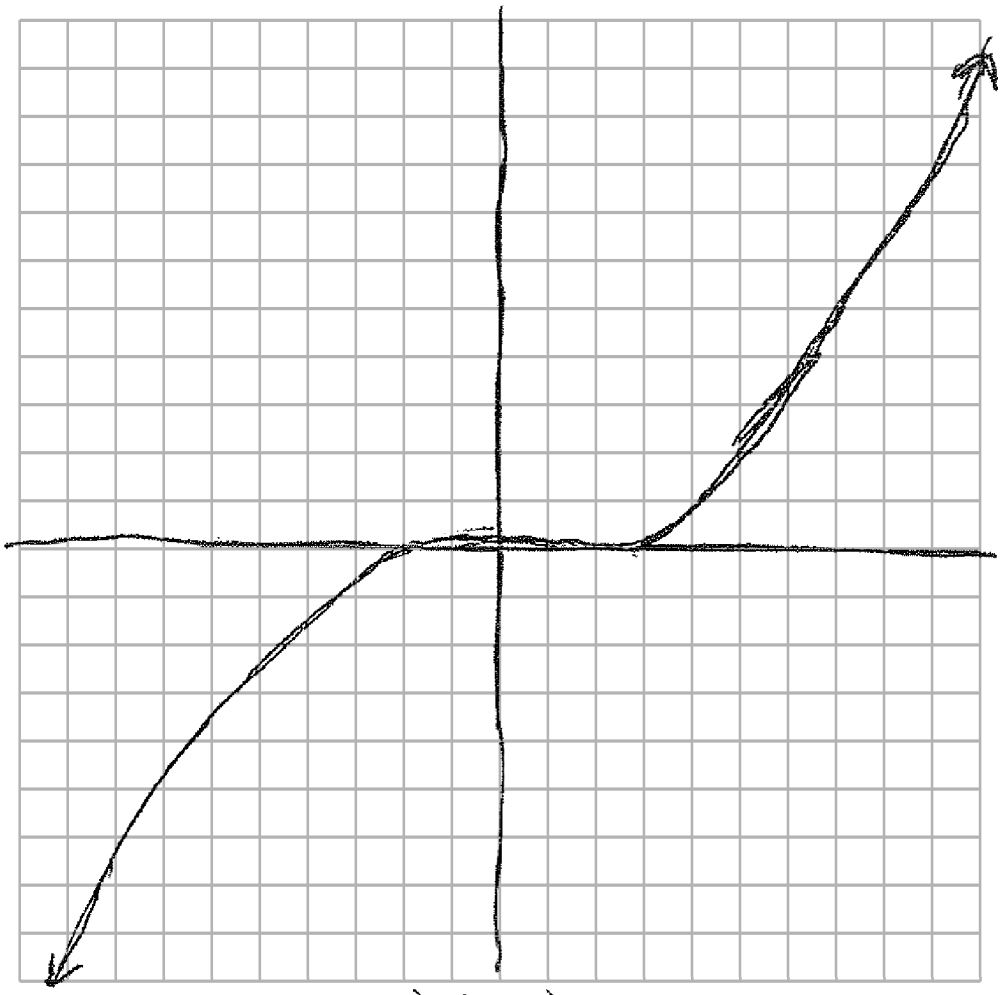
29 On the grid below, sketch a cubic polynomial whose zeros are 1, 3, and −2.



Score 1: The student made one graphing error.

Question 29

29 On the grid below, sketch a cubic polynomial whose zeros are 1, 3, and −2.



$(x-1)(x-3)(x+2)$

x^3-2x^2-5x+6

$x^2-3x-x+3$

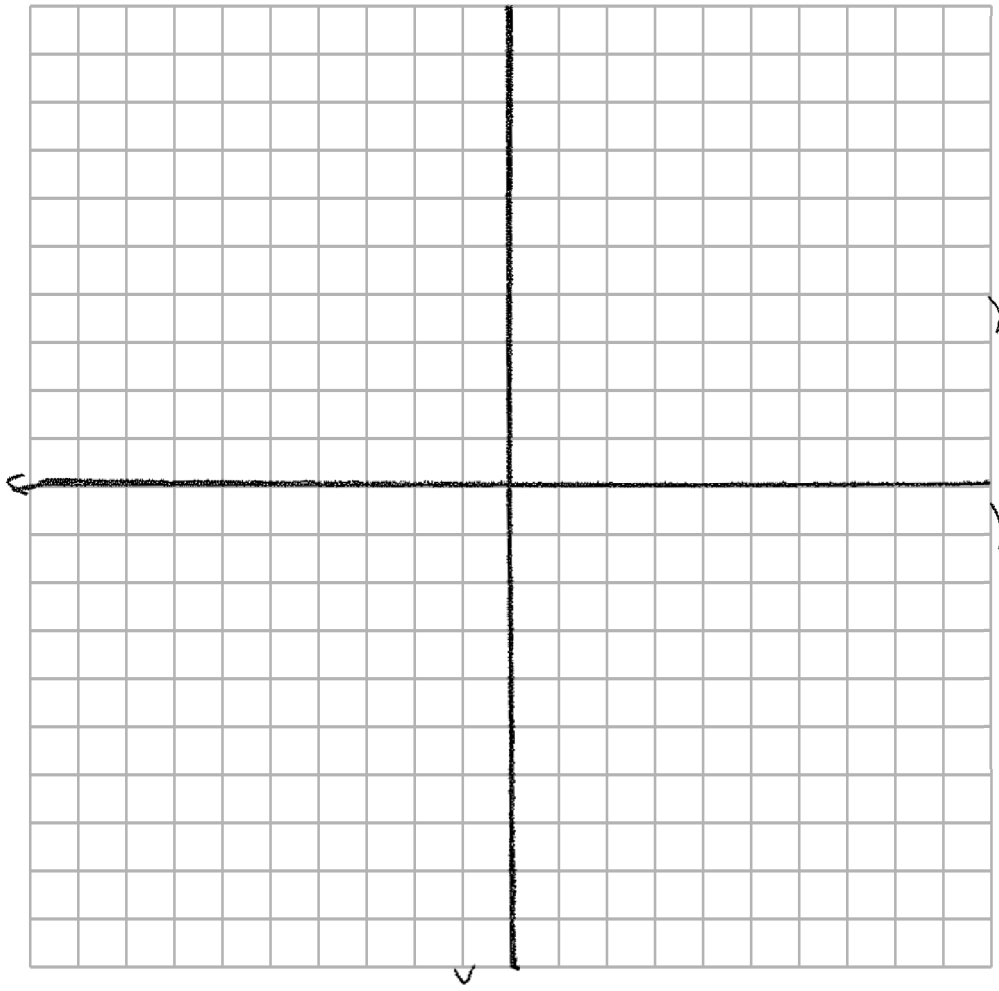
$(x^2-4x+3)(x+2)$

$x^3+2x^2-4x^2-8x+3x+6$

Score 1: The student produced an insufficient sketch.

Question 29

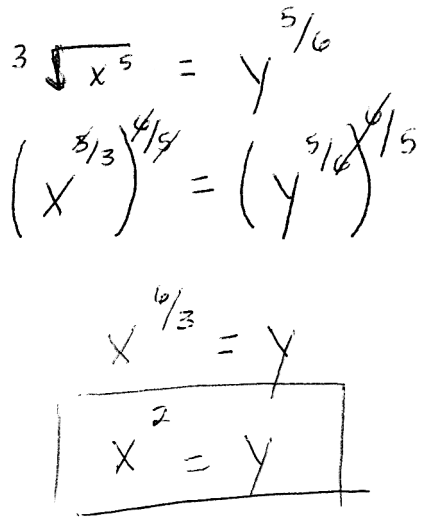
29 On the grid below, sketch a cubic polynomial whose zeros are 1, 3, and −2.



Score 0: The student did not provide a sketch.

Question 30

30 Given the equal terms $\sqrt[3]{x^5}$ and $y^{\frac{5}{6}}$, determine and state y, in terms of x.



Score 2: The student gave a complete and correct response.

Question 30

30 Given the equal terms $\sqrt[3]{x^5}$ and $y^{\frac{5}{6}}$, determine and state y, in terms of x.

$\sqrt[3]{x^5} = y^{\frac{5}{6}}$

$x^{\frac{5}{3}} = y^{\frac{5}{6}}$

$\therefore y^{\frac{5}{3}\left(\frac{6}{5}\right)} = x^{\frac{5}{6}\left(\frac{6}{5}\right)}$

$y^{\frac{30}{15}} = x$

$\boxed{y^2 = x}$

Score 1: The student made a transcription error.

Question 30

30 Given the equal terms $\sqrt[3]{x^5}$ and $y^{\frac{5}{6}}$, determine and state y, in terms of x.

$3\sqrt{x^5} = y^{5/6}$

$x^{3/5} = y^{5/6}$

$y = (x^{3/5})^{6/5}$

Score 1: The student interchanged the root and power.

Question 30

30 Given the equal terms $\sqrt[3]{x^5}$ and $y^{\frac{5}{6}}$, determine and state y, in terms of x.

x^1 ← 3 only goes into 5 once.

$x\sqrt{x^2} \rightarrow x \cdot x \rightarrow x^2$

Score 0: The student used an incorrect procedure to get x^2.

Question 31

31 The results of a survey of the student body at Central High School about television viewing preferences are shown below.

	Comedy Series	Drama Series	Reality Series	Total
Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

Are the events "student is a male" and "student prefers reality series" independent of each other? Justify your answer.

Two events are independent if $P(R \text{ and } M) = P(R) \cdot P(M)$

$\frac{70}{490} \stackrel{?}{=} \frac{180}{490} \cdot \frac{230}{490}$

$\frac{70}{490} \stackrel{?}{=} \frac{41400}{240,100}$

$\frac{1}{7} \neq \frac{414}{2401}$

No, because

$P(R \text{ and } M) \neq P(R) \cdot P(m)$

Score 2: The student gave a complete and correct response.

Question 31

31 The results of a survey of the student body at Central High School about television viewing preferences are shown below.

	Comedy Series	Drama Series	Reality Series	Total
Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

Are the events "student is a male" and "student prefers reality series" independent of each other? Justify your answer.

$P(M/R) \stackrel{?}{=} P(M)$

$70/180 \neq 230/490$

$.3888... \neq .4693...$

The events are not independent because $P(m/R) \neq P(m)$

Score 2: The student gave a complete and correct response.

Question 31

31 The results of a survey of the student body at Central High School about television viewing preferences are shown below.

	Comedy Series	Drama Series	Reality Series	Total
Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

Are the events "student is a male" and "student prefers reality series" independent of each other? Justify your answer.

$\frac{230}{490} = .47$ $\frac{70}{230} = .30$

No because they have different probabilities.

Score 1: The student found one of the probabilities incorrectly in comparison.

Question 31

31 The results of a survey of the student body at Central High School about television viewing preferences are shown below.

	Comedy Series	Drama Series	Reality Series	Total
Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

Are the events "student is a male" and "student prefers reality series" independent of each other? Justify your answer.

$P(m) \cdot P(R) \stackrel{?}{=} P(m \text{ and } R)$

$\frac{230}{490} \cdot \frac{180}{490} \stackrel{?}{=} \frac{70}{490}$

$\frac{41400}{240100} \neq \frac{70}{490}$

Score 1: The student gave a correct justification, but did not state 'no'.

Question 31

31 The results of a survey of the student body at Central High School about television viewing preferences are shown below.

	Comedy Series	Drama Series	Reality Series	Total
Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

Are the events "student is a male" and "student prefers reality series" independent of each other? Justify your answer.

$\frac{230}{490} \approx .46$ $\frac{180}{490} \approx .36$

different probabilities.

Score 0: The student found one of the probabilities incorrectly in comparison and did not state "no".

Question 31

31 The results of a survey of the student body at Central High School about television viewing preferences are shown below.

	Comedy Series	Drama Series	Reality Series	Total
Males	95	65	70	230
Females	80	70	110	260
Total	175	135	180	490

Male: $\frac{230}{490}$

Male reality: $\frac{70}{230}$

Are the events "student is a male" and "student prefers reality series" independent of each other? Justify your answer.

No, because the amount of male students who prefer reality shows is dependent on the amount of total males there are.

Score 0: The student compared incorrect probabilities and gave an incorrect justification.

Question 32

32 Given $f(x) = 3x^2 + 7x - 20$ and $g(x) = x - 2$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

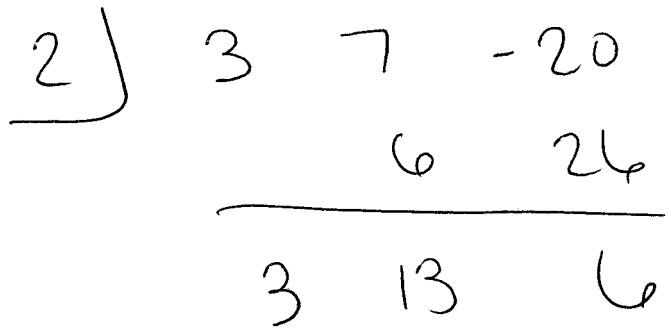
$$
\begin{array}{r|l}
x-2 & 3x+13 \\
\cline{2-2}
 & 3x^2+7x-20 \\
 & -3x^2+6x \\
\cline{2-2}
 & 13x-20 \\
 & -13x+26 \\
\cline{2-2}
 & 6
\end{array}
$$

$$(3x+13)+\frac{6}{x-2}$$

Score 2: The student gave a complete and correct response.

Question 32

32 Given $f(x) = 3x^2 + 7x - 20$ and $g(x) = x - 2$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.



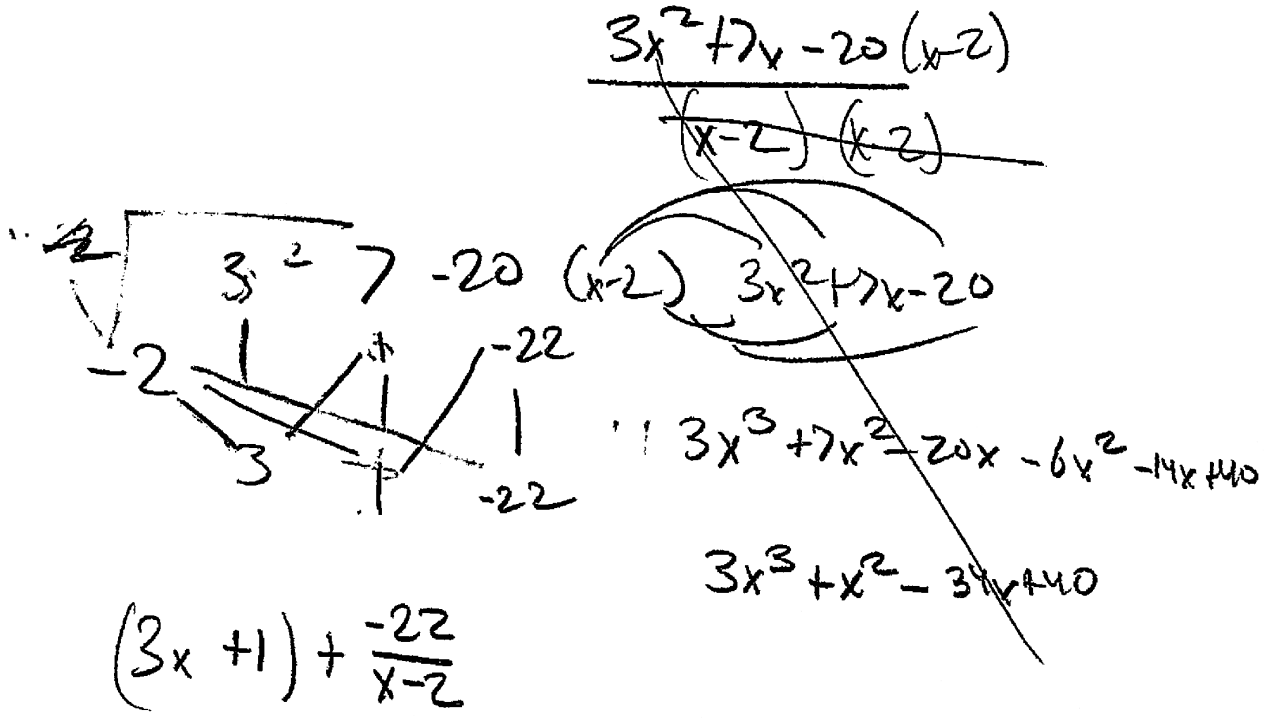
Answer: ~~$3x^2 + 13x + 6$ / $x-2$~~

$$3x + 13 + \frac{6}{x-2}$$

Score 2: The student gave a complete and correct response.

Question 32

32 Given $f(x) = 3x^2 + 7x - 20$ and $g(x) = x - 2$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.



Score 1: The student used −2 instead of 2.

Question 32

32 Given $f(x) = 3x^2 + 7x - 20$ and $g(x) = x - 2$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.

$\frac{3x^2+7x-20}{x-2}$

$x-2\overline{)3x^2+7x-20}$

$3x+13$

$3x^2-6x$

$13x-20$

$13x-26$

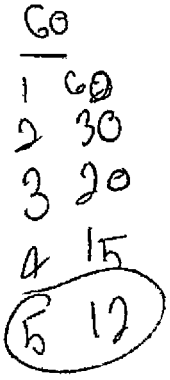
6

$3x+13$ remainder 6

Score 1: The student did not give the answer in the required form.

Question 32

32 Given $f(x) = 3x^2 + 7x - 20$ and $g(x) = x - 2$, state the quotient and remainder of $\frac{f(x)}{g(x)}$, in the form $q(x) + \frac{r(x)}{g(x)}$.



$\frac{3x^2+7x-20}{x-2}$

$\frac{(3x-5)(x+4)}{x-2}$

$3x^2+7x-20$

$(3x^2+12x)+(-5x-20)$

$3x(x+4)-5(x+4)$

Score 0: The student did not use a correct procedure to find a quotient that has a remainder.

Question 33

33 Algebraically determine the values of h and k to correctly complete the identity stated below.

$$2x^3 - 10x^2 + 11x - 7 = (x - 4)(2x^2 + hx + 3) + k$$

$2x^3+hx^2+3x-8x^2-4hx-12+k$

$2x^3 + hx^2 - 8x^2 + 3x - 4hx - 12 + k$

$-8x^2 + hx^2 = -10x^2$

$x^2(-8+h) = x^2(-10)$

$-8+h = -10$

$h = -2$

$3x - 4hx = 11x$

$x(3 - 4h) = x(11)$

$3 - 4h = 11$

$-4h = 8$

$h = -2$

$-12 + k = -7$

$k = 5$

Score 4: The student gave a complete and correct response.

Question 33

33 Algebraically determine the values of h and k to correctly complete the identity stated below.

$$2x^3 - 10x^2 + 11x - 7 = (x - 4)(2x^2 + hx + 3) + k$$

$2x^3 - 10x^2 + 11x - 7 = 2x^2 + hx^2 - 4hx + K$

$2x^3 - 10x^2 + 11x - 7 = hx^2 - 4hx + K$

$-2x^3 + 8x^2 - 3x + 12$

$-2x^2 + 8x + 5 = hx^2 - 4hx + K$

$h = -2$

$K = 5$

Score 4: The student gave a complete and correct response.

Question 33

33 Algebraically determine the values of h and k to correctly complete the identity stated below.

$$2x^3 - 10x^2 + 11x - 7 = (x - 4)(2x^2 + hx + 3) + k$$

$2x^3-10x^2+11x-7=2x^3+hx^2+3x-8x^2-4hx-12+k$

$-2x^3+8x^2-3x+12$ $-2x^3$ $-3x+8x^2$ $+12$

2, 3

$-2x^2+8x+10=hx^2-4hx+k$

$-2(x^2-4x-5)=hx^2-4hx+k$

$h=-2$ $\quad k=10$

Score 3: The student made one computational error.

Question 33

33 Algebraically determine the values of h and k to correctly complete the identity stated below.

$$2x^3 - 10x^2 + 11x - 7 = (x - 4)(2x^2 + hx + 3) + k$$

$2x^3 - 10x^2 + 11x - 7$

$2x^2(x - 5)$ (illegible)

$(x-4)(2x^2+hx+3)+k$

$2x^3+hx^2+3x-8x^2-4hx-12+k$

$2x^3+(h-8x^2)-hx-12+k$

$h = 18$
$k = 5$

Score 2: The student only found the correct value for k.

Question 33

33 Algebraically determine the values of h and k to correctly complete the identity stated below.

$$2x^3 - 10x^2 + 11x - 7 = (x - 4)(2x^2 + hx + 3) + k$$

$2x^3 - 10x^2 + 11x - 7 = 2x^3 + hx^2 + 3x - 8x^2 - 4hx - 12 + k$

$= 2x^3 + hx^2 - 8x^2 + 3x - 4hx - 12 + k$

Score 1: The student distributed correctly.

Question 33

33 Algebraically determine the values of h and k to correctly complete the identity stated below.

$$2x^3 - 10x^2 + 11x - 7 = (x - 4)(2x^2 + hx + 3) + k$$

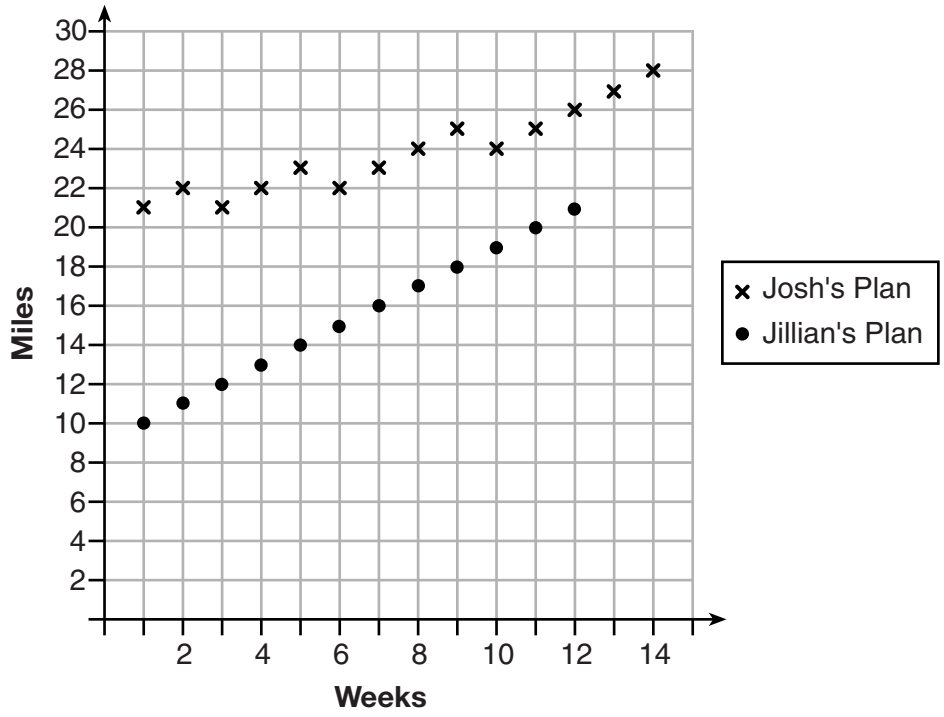
$2x^3-10x^2+11x-7=2x^3+hx^2+3x-8x^2-4hx+12+k$

$2x^3-10x^2+11x-7=2x^3-8hx^2-hx+12+k$

Score 0: The student did not show enough correct work to receive any credit.

Question 34

34 Elaina has decided to run the Buffalo half-marathon in May. She researched training plans on the Internet and is looking at two possible plans: Jillian's 12-week plan and Josh's 14-week plan. The number of miles run per week for each plan is plotted below.



Which one of the plans follows an arithmetic pattern? Explain how you arrived at your answer.

Jillian's because hers increases by one each time, unlike Josh's whose does not have a value added each week.

Write a recursive definition to represent the number of miles run each week for the duration of the plan you chose.

Jillian's $a_{n+1} = a_n + d$

$a_{n+1} = a_n + 1$

$a_1 = 10$

Jillian's plan has an alternative if Elaina wanted to train instead for a full 26-mile marathon. Week one would start at 13 miles and follow the same pattern for the half-marathon, but it would continue for 14 weeks. Write an explicit formula, in *simplest form*, to represent the number of miles run each week for the full-marathon training plan.

$a_1 = 13$ $a_n = a_1 + (n-1)d$

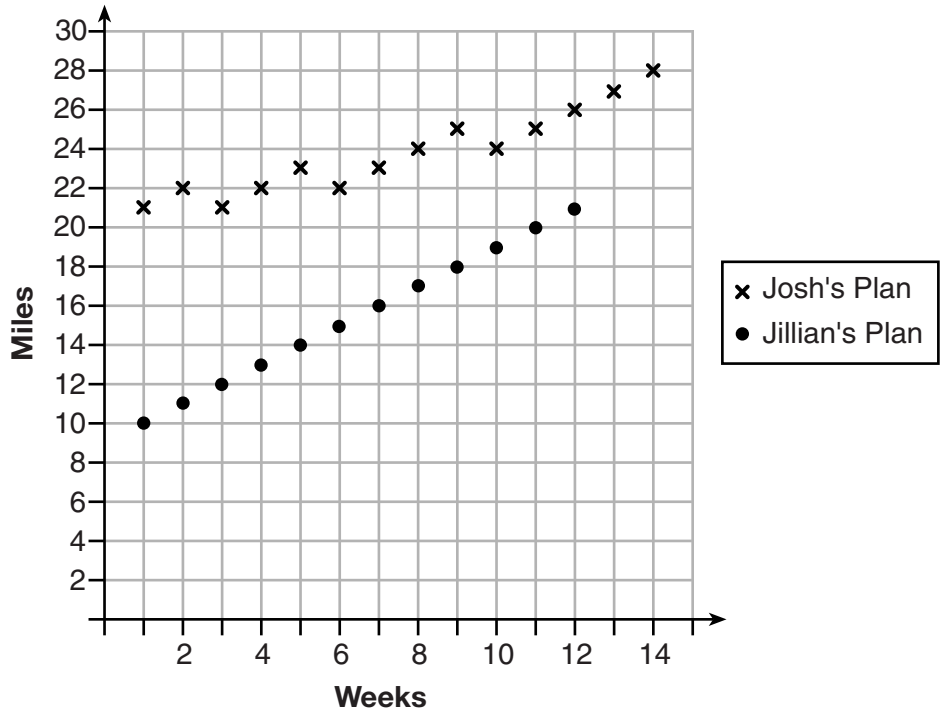
$a_n = 13 + (n-1)1$

$a_n = n + 12$

Score 4: The student gave a complete and correct response.

Question 34

34 Elaina has decided to run the Buffalo half-marathon in May. She researched training plans on the Internet and is looking at two possible plans: Jillian's 12-week plan and Josh's 14-week plan. The number of miles run per week for each plan is plotted below.



Which one of the plans follows an arithmetic pattern? Explain how you arrived at your answer.

Jillian's plan follows an arithmetic pattern because from the graph it is visible that one mile extra is added each week.

Write a recursive definition to represent the number of miles run each week for the duration of the plan you chose.

$a_1 = 10$

$a_{n-1} + 1 = a_n$

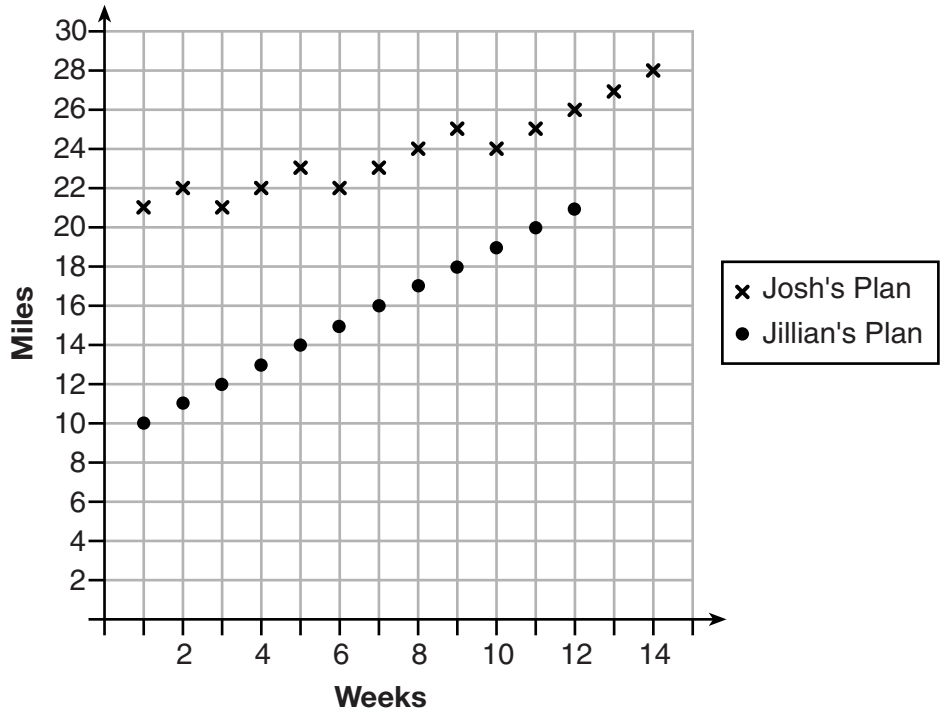
Jillian's plan has an alternative if Elaina wanted to train instead for a full 26-mile marathon. Week one would start at 13 miles and follow the same pattern for the half-marathon, but it would continue for 14 weeks. Write an explicit formula, in *simplest form*, to represent the number of miles run each week for the full-marathon training plan.

$a_n = 13 + (n-1)1$

Score 3: The student did not express the explicit formula in simplest form.

Question 34

34 Elaina has decided to run the Buffalo half-marathon in May. She researched training plans on the Internet and is looking at two possible plans: Jillian's 12-week plan and Josh's 14-week plan. The number of miles run per week for each plan is plotted below.



Which one of the plans follows an arithmetic pattern? Explain how you arrived at your answer.

Jillian's, because one mile is added each week

Write a recursive definition to represent the number of miles run each week for the duration of the plan you chose.

$t_1 = 10$

$t_n = 1 + t_{n-1}$

Jillian's plan has an alternative if Elaina wanted to train instead for a full 26-mile marathon. Week one would start at 13 miles and follow the same pattern for the half-marathon, but it would continue for 14 weeks. Write an explicit formula, in *simplest form*, to represent the number of miles run each week for the full-marathon training plan.

$t_n = t_1 + d(n-1)$

$t_n = 13 + 1(n-1)$

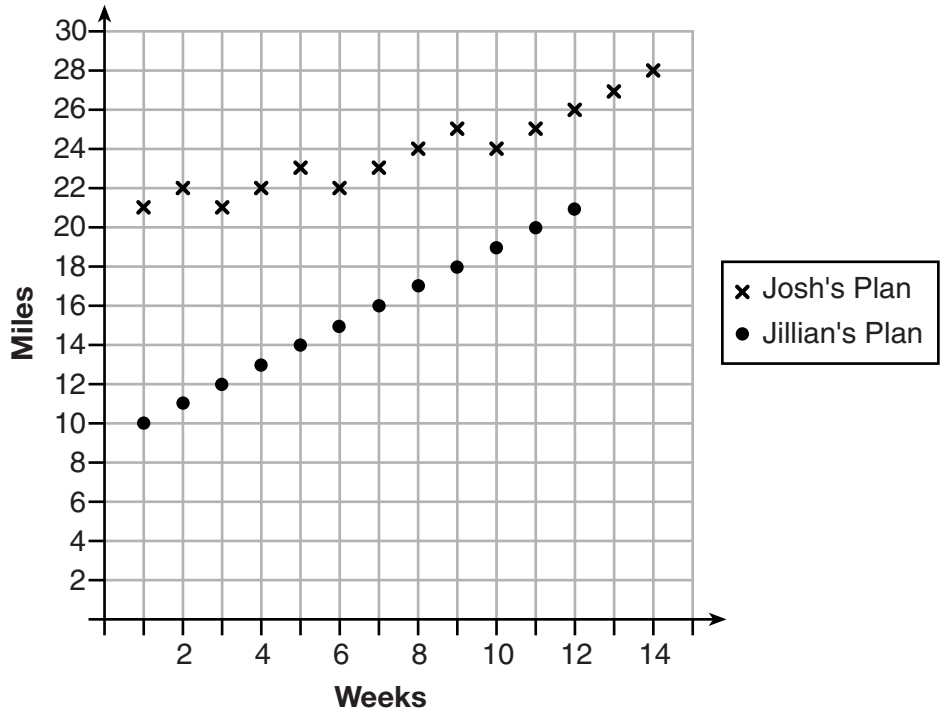
$t_n = 13 + n - 1$

$t_n = 12 + n$

Score 3: The student gave an incorrect recursive definition.

Question 34

34 Elaina has decided to run the Buffalo half-marathon in May. She researched training plans on the Internet and is looking at two possible plans: Jillian's 12-week plan and Josh's 14-week plan. The number of miles run per week for each plan is plotted below.



Which one of the plans follows an arithmetic pattern? Explain how you arrived at your answer.

Jillian because she increased the distance run by 1 mile each week.

Write a recursive definition to represent the number of miles run each week for the duration of the plan you chose.

$a_1 = 10$

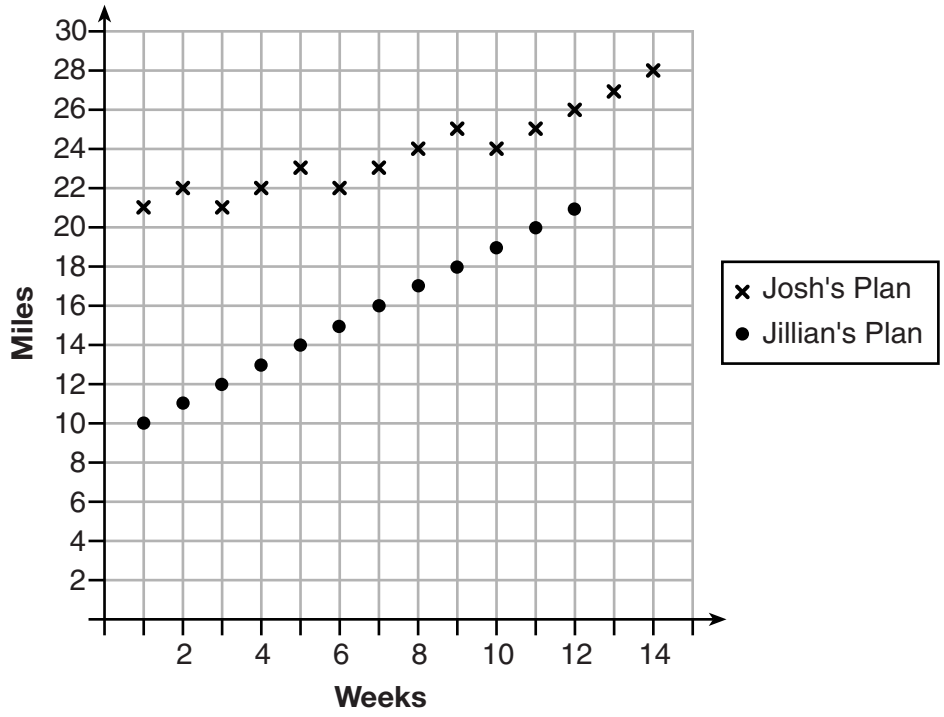
$a_n = a_{n-1} + 1$

Jillian's plan has an alternative if Elaina wanted to train instead for a full 26-mile marathon. Week one would start at 13 miles and follow the same pattern for the half-marathon, but it would continue for 14 weeks. Write an explicit formula, in *simplest form*, to represent the number of miles run each week for the full-marathon training plan.

Score 2: The student did not complete the third part.

Question 34

34 Elaina has decided to run the Buffalo half-marathon in May. She researched training plans on the Internet and is looking at two possible plans: Jillian's 12-week plan and Josh's 14-week plan. The number of miles run per week for each plan is plotted below.



Which one of the plans follows an arithmetic pattern? Explain how you arrived at your answer.

Jillian because she steadily increases her plan.

Write a recursive definition to represent the number of miles run each week for the duration of the plan you chose.

$A_n = A_1 + (n-1)$ $\quad A_1 = 10$

(A_n: week number; A_1: original value)

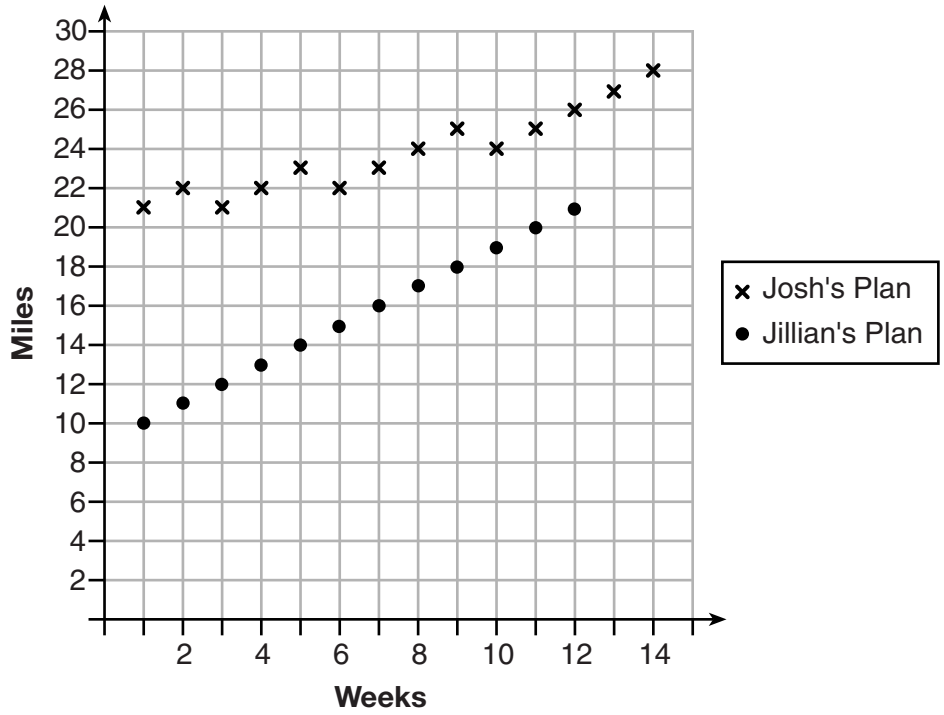
Jillian's plan has an alternative if Elaina wanted to train instead for a full 26-mile marathon. Week one would start at 13 miles and follow the same pattern for the half-marathon, but it would continue for 14 weeks. Write an explicit formula, in *simplest form*, to represent the number of miles run each week for the full-marathon training plan.

$A_n = 13r(n-1)$

Score 1: The student gave an incorrect explanation and recursive definition, and did not simplify the explicit definition.

Question 34

34 Elaina has decided to run the Buffalo half-marathon in May. She researched training plans on the Internet and is looking at two possible plans: Jillian's 12-week plan and Josh's 14-week plan. The number of miles run per week for each plan is plotted below.



Which one of the plans follows an arithmetic pattern? Explain how you arrived at your answer.

Jillian's plan follows an arithmetic pattern because the common difference is 1.

Write a recursive definition to represent the number of miles run each week for the duration of the plan you chose.

$a_n = a_{n-1} + 1$

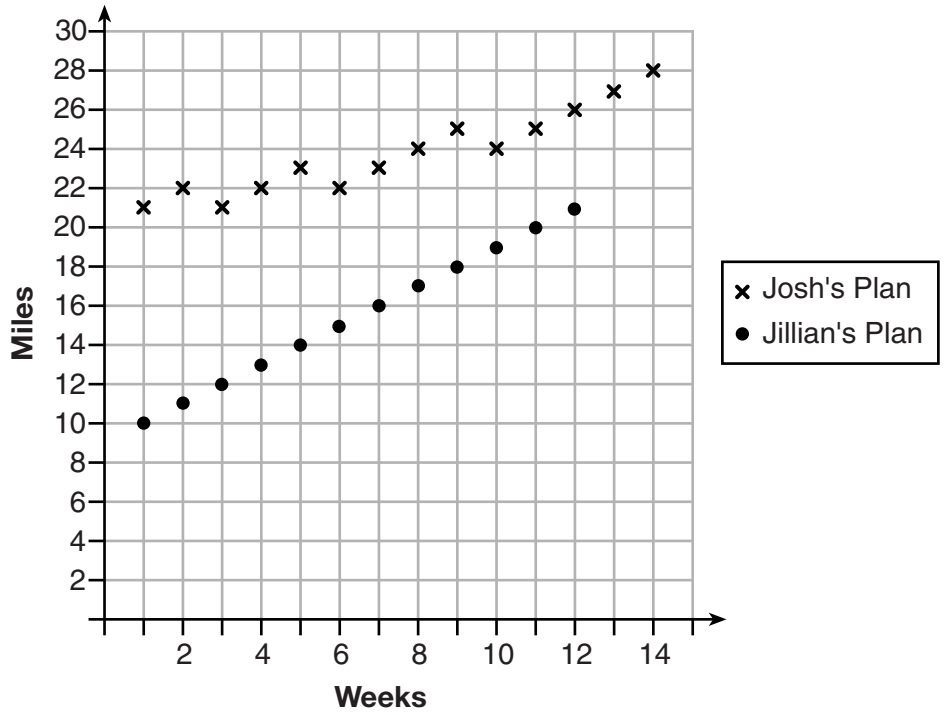
Jillian's plan has an alternative if Elaina wanted to train instead for a full 26-mile marathon. Week one would start at 13 miles and follow the same pattern for the half-marathon, but it would continue for 14 weeks. Write an explicit formula, in *simplest form*, to represent the number of miles run each week for the full-marathon training plan.

$a_n =$

Score 1: The student did not state a recursive or explicit definition correctly.

Question 34

34 Elaina has decided to run the Buffalo half-marathon in May. She researched training plans on the Internet and is looking at two possible plans: Jillian's 12-week plan and Josh's 14-week plan. The number of miles run per week for each plan is plotted below.



Which one of the plans follows an arithmetic pattern? Explain how you arrived at your answer.

Josh's, it has a pattern of dropping one after going up n+1 each time

Write a recursive definition to represent the number of miles run each week for the duration of the plan you chose.

Jillian's plan: $y = x + 9$

Jillian's plan has an alternative if Elaina wanted to train instead for a full 26-mile marathon. Week one would start at 13 miles and follow the same pattern for the half-marathon, but it would continue for 14 weeks. Write an explicit formula, in *simplest form*, to represent the number of miles run each week for the full-marathon training plan.

$y = x + 12$

Score 0: The student made multiple errors.

Question 35

35 The guidance department has reported that of the senior class, 2.3% are members of key club, *K*, 8.6% are enrolled in AP Physics, *P*, and 1.9% are in both.

Determine the probability of *P* given *K*, to the *nearest tenth of a percent*.

$$P(P/K) = \frac{P(P \cap K)}{P(K)} = \frac{1.9}{2.3} \approx 82.6\ \%$$

The principal would like a basic interpretation of these results. Write a statement relating your calculated probabilities to student enrollment in the given situation.

If we choose a student who is a member of key club, they have an 82.6 % probability of being in AP Physics

Score 4: The student gave a complete and correct response.

Question 35

35 The guidance department has reported that of the senior class, 2.3% are members of key club, *K*, 8.6% are enrolled in AP Physics, *P*, and 1.9% are in both.

Determine the probability of *P* given *K*, to the *nearest tenth of a percent*.

1.9/2.3 ×100 → 82.6%

The principal would like a basic interpretation of these results. Write a statement relating your calculated probabilities to student enrollment in the given situation.

Score 3: The student did not provide a statement.

Question 35

35 The guidance department has reported that of the senior class, 2.3% are members of key club, *K*, 8.6% are enrolled in AP Physics, *P*, and 1.9% are in both.

Determine the probability of *P* given *K*, to the *nearest tenth of a percent*.

$$P(K|P) = \frac{P(K \cap P))}{P(P)} = \frac{.019}{.086} = .2209$$

22.1%

The principal would like a basic interpretation of these results. Write a statement relating your calculated probabilities to student enrollment in the given situation.

The probability that a student is a member of the key club is 22.1% given that the student is enrolled in AP Physics.

Score 2: The student found 22.1% and wrote an appropriate statement.

Question 35

35 The guidance department has reported that of the senior class, 2.3% are members of key club, *K*, 8.6% are enrolled in AP Physics, *P*, and 1.9% are in both.

Determine the probability of *P* given *K*, to the *nearest tenth of a percent*.

$\frac{.086X}{.086} = \frac{.019}{.086}$

$X = 22.1\%$

The principal would like a basic interpretation of these results. Write a statement relating your calculated probabilities to student enrollment in the given situation.

If a student is enrolled in key club, then there is a 1.9% that he will also be enrolled in AP Physics.

Score 1: The student made a conceptual error and did not base the statement on the calculation.

Question 35

35 The guidance department has reported that of the senior class, 2.3% are members of key club, *K*, 8.6% are enrolled in AP Physics, *P*, and 1.9% are in both.

Determine the probability of *P* given *K*, to the *nearest tenth of a percent*.

$(P)(K) =$

$(2.3)(8.6) = 19.78$

The principal would like a basic interpretation of these results. Write a statement relating your calculated probabilities to student enrollment in the given situation.

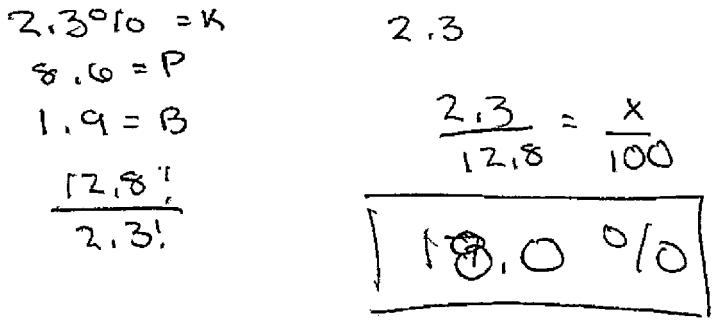
Of the students who are taking AP physics and are members of the key club, 19.78% of them will be enrolled in both.

Score 0: The student made multiple conceptual errors.

Question 35

35 The guidance department has reported that of the senior class, 2.3% are members of key club, *K*, 8.6% are enrolled in AP Physics, *P*, and 1.9% are in both.

Determine the probability of *P* given *K*, to the *nearest tenth of a percent*.



The principal would like a basic interpretation of these results. Write a statement relating your calculated probabilities to student enrollment in the given situation.

18% of the seniors are members of Key Club.

Score 0: The student made multiple errors.

Question 36

36 Using the formula below, determine the monthly payment on a 5-year car loan with a monthly percentage rate of 0.625% for a car with an original cost of $21,000 and a $1000 down payment, to the *nearest cent*.

$$P_n = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

P_n = present amount borrowed

n = number of monthly pay periods

PMT = monthly payment

i = interest rate per month

$20000 = PMT\left[\frac{1-(1+.00625)^{-60}}{.00625}\right]$

$PMT = 400.7589719$

$PMT = 400.76$

The affordable monthly payment is $300 for the same time period. Determine an appropriate down payment, to the *nearest dollar*.

$21{,}000 - x = 300\left[\frac{1-(1+.00625)^{-60}}{.00625}\right]$

$-x = -6028.407545$

$x = 6028$

$6028

Score 4: The student gave a complete and correct response.

Question 36

36 Using the formula below, determine the monthly payment on a 5-year car loan with a monthly percentage rate of 0.625% for a car with an original cost of $21,000 and a $1000 down payment, to the *nearest cent*.

$$P_n = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

P_n = present amount borrowed

n = number of monthly pay periods

PMT = monthly payment

i = interest rate per month

20 000 = Pmt(1-(1+.00625)^-60 / .00625)

$400.76

The affordable monthly payment is $300 for the same time period. Determine an appropriate down payment, to the *nearest dollar*.

$6028

Score 3: The student did not show work to find $6028.

Question 36

36 Using the formula below, determine the monthly payment on a 5-year car loan with a monthly percentage rate of 0.625% for a car with an original cost of $21,000 and a $1000 down payment, to the *nearest cent*.

$$P_n = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

P_n = present amount borrowed

n = number of monthly pay periods

PMT = monthly payment

i = interest rate per month

$20000 = PMT\left(\frac{1-(1+0.00625)^{-60}}{0.00625}\right)$

$20000 = PMT(49.90530818)$

$PMT = 400.76$

The affordable monthly payment is $300 for the same time period. Determine an appropriate down payment, to the *nearest dollar*.

Score 2: The student found $400.76 correctly.

Question 36

36 Using the formula below, determine the monthly payment on a 5-year car loan with a monthly percentage rate of 0.625% for a car with an original cost of $21,000 and a $1000 down payment, to the *nearest cent*.

$$P_n = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

P_n = present amount borrowed

n = number of monthly pay periods

PMT = monthly payment

i = interest rate per month

$P_n = PMT\left(\frac{1-(1+i)^{-n}}{r}\right)$

$20000 = X\left(\frac{1-(1+.00625)^{-60}}{.00625}\right)$

$20000 = 49.9053X$

$X = \$400.8$

$i = .00625$

$PMT = X$

$n = 60$ months

$P_n = 20000$

The affordable monthly payment is $300 for the same time period. Determine an appropriate down payment, to the *nearest dollar*.

$n = 60$

$PMT = 300$

$i = .00625$

$P_n = PMT\left(\frac{1-(1+i)^{-n}}{r}\right)$

$P_n = 300\left(\frac{1-(1+.00625)^{-60}}{.00625}\right)$

$P_n \approx \$14972$

Score 2: The student made a rounding error and did not subtract from $21,000.

Question 36

36 Using the formula below, determine the monthly payment on a 5-year car loan with a monthly percentage rate of 0.625% for a car with an original cost of $21,000 and a $1000 down payment, to the *nearest cent*.

$$P_n = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

P_n = present amount borrowed

n = number of monthly pay periods

PMT = monthly payment

i = interest rate per month

$21000 = PMT\left(\frac{1-(1+.00625)^{-60}}{.00625}\right)$

$\frac{21000}{49.90530818} = \frac{X\ 49.90530818}{49.90530818}$

420.79692 05

420.80

The affordable monthly payment is $300 for the same time period. Determine an appropriate down payment, to the *nearest dollar*.

$X = 300\left(\frac{1-(1+.00625)^{-60}}{.00625}\right)$

$X = -32728.46755$

32728

Score 1: The student did not take off the original down payment and showed no further correct work.

Question 36

36 Using the formula below, determine the monthly payment on a 5-year car loan with a monthly percentage rate of 0.625% for a car with an original cost of $21,000 and a $1000 down payment, to the *nearest cent*.

$$P_n = PMT\left(\frac{1-(1+i)^{-n}}{i}\right)$$

P_n = present amount borrowed

n = number of monthly pay periods

PMT = monthly payment

i = interest rate per month

$21{,}000 = PMT\left(\frac{1-(1+.625\%)^{-60}}{6\,25\%}\right)$

$\frac{21000}{.016} = \frac{PMT\,x.016}{.016}$

$PMT = \$1{,}312.5$

The affordable monthly payment is $300 for the same time period. Determine an appropriate down payment, to the *nearest dollar*.

$21000 = 300\left(\frac{1-(1+62.5\%)^{-60}}{62.5}\right)$

$21000 = 300 \times .016$

$21000 = 4.8$

$-4.8 \quad -4.8$

$\$\ 1{,}995.2$

Score 0: The student made multiple errors.

Question 37

37 The speed of a tidal wave, s, in hundreds of miles per hour, can be modeled by the equation $s = \sqrt{t} - 2t + 6$, where t represents the time from its origin in hours. Algebraically determine the time when $s = 0$.

$0 = \sqrt{t} - 2t + 6$

$(2t - 6)^2 = (\sqrt{t})^2$

$4t^2 - 24t + 36 = t$

$4t^2 - 25t + 36 = 0$

$(4t - 9)(t - 4) = 0$

$t = \frac{9}{4}$ $t = 4$

reject

orignal time was 4hrs

How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.

$S = \sqrt{1} - 2(1) + 6 = 5$

$S = \sqrt{3} - 2(3) + 6 = 1.732050809$

500.

$-\ 173.732050809$

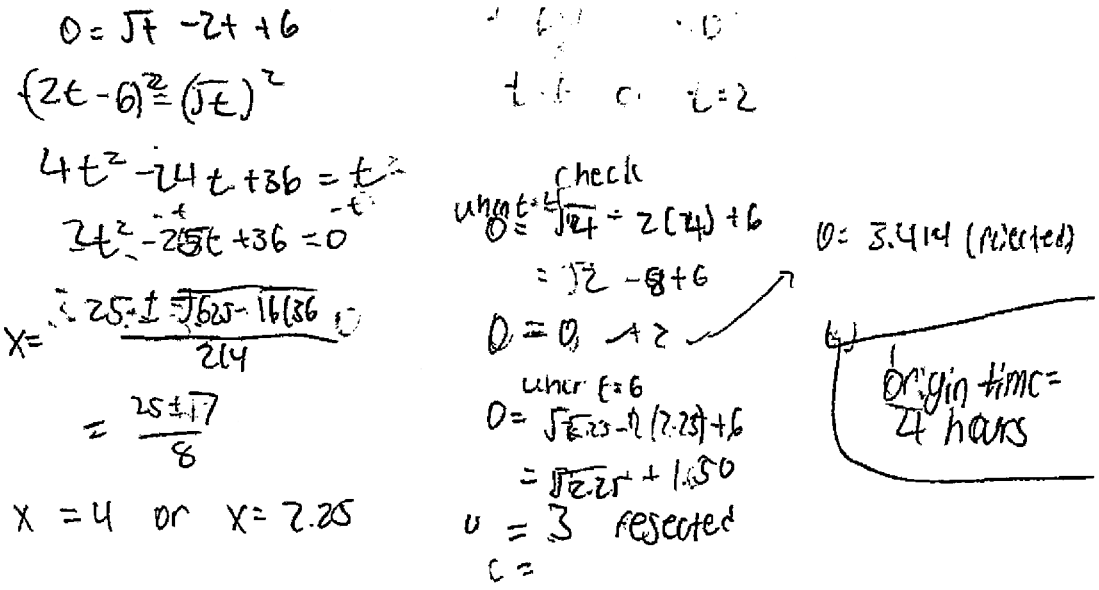
326.7949192

327

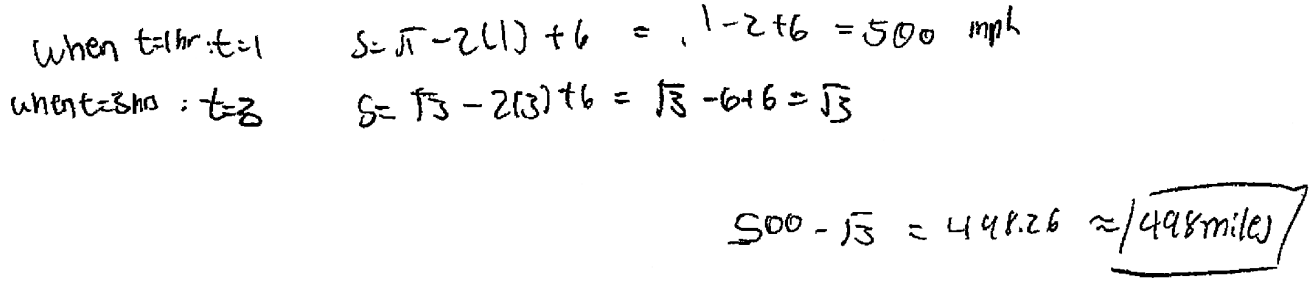
Score 6: The student gave a comple and correct response.

Question 37

37 The speed of a tidal wave, s, in hundreds of miles per hour, can be modeled by the equation $s = \sqrt{t} - 2t + 6$, where t represents the time from its origin in hours. Algebraically determine the time when $s = 0$.



How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.



Score 5: The student did not convert $\sqrt{3}$ to miles.

Question 37

37 The speed of a tidal wave, s, in hundreds of miles per hour, can be modeled by the equation $s = \sqrt{t} - 2t + 6$, where t represents the time from its origin in hours. Algebraically determine the time when $s = 0$.

$\sqrt{t} - 2t + 6 = 0$

$-6 \quad -6$

$\sqrt{t} - 2t = -6$

$+2t \quad +2t$

$(\sqrt{t})^2 = (2t - 6)^2$

$t = (2t - 6)(2t - 6)$

$4t^2 - 12t - 12t + 36$

$4t^2 - 24t + 36$

$t = 4t^2 - 24t + 36$

$-t \quad -t$

$0 = 4t^2 - 25t + 36$

$t = 4, 2.25$

How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.

$s = \sqrt{1} - 2(1) + 6$

$s = 5$

500 mph

$s = \sqrt{3} - 2(3) + 6$

$s = \sqrt{3}$

$\sqrt{3} \approx 1.73$

173 mph

$500 - 173 =$ 327 mph

Score 4: The student found a correct quadratic equation in standard form and 327.

Question 37

37 The speed of a tidal wave, s, in hundreds of miles per hour, can be modeled by the equation $s = \sqrt{t} - 2t + 6$, where t represents the time from its origin in hours. Algebraically determine the time when $s = 0$.

$\sqrt{t} - 2t + 6 = 0$

$(\sqrt{t})^2 = (2t + 6)^2$

$t = 4t^2 - 24t + 36$

$4t^2 - 25t + 36 = 0$

4

$4t^2 - 24t + 36$

$x = \frac{25 \pm \sqrt{49}}{8}$

$x = \frac{25 \pm 7}{8}$

$x = 4 \quad x = 2.25$

How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.

2x faster b/c of the coefficient 2 being used.

Score 4: The student found 4 correctly.

Question 37

37 The speed of a tidal wave, s, in hundreds of miles per hour, can be modeled by the equation $s = \sqrt{t} - 2t + 6$, where t represents the time from its origin in hours. Algebraically determine the time when $s = 0$.

$0 = \sqrt{t} - 2t + 6$

$(-\sqrt{t})^2 = (-2t + 6)^2$

$t - = 4t^2 - 24t + 36$

$0 = 4t^2 - 25t + 36$

$t = 4$

How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.

$\sqrt{1} - 2(1) + 6$

$1 - 2 + 6$

5

$\sqrt{3} - 2(3) + 6$

$\sqrt{3}$

$5 - \sqrt{3}$

3 miles / hour

Score 3: The student found a correct quadratic equation, but did not convert to miles.

Question 37

37 The speed of a tidal wave, s, in hundreds of miles per hour, can be modeled by the equation $s = \sqrt{t} - 2t + 6$, where t represents the time from its origin in hours. Algebraically determine the time when $s = 0$.

$0 - \sqrt{t} - 2t + 6$

$(2t-6)(2t-6)$ $(2t-6)^2 = (\sqrt{t})^2$

$4t^2 - 12t - 12t + 36$

$4t^2 - 24t + 36 = t$

$4t^2 - 25t + 36 = 0$

$\frac{25 \pm \sqrt{-25^2 - 4(4)(36)}}{2(4)}$

$\frac{25 \pm \sqrt{49}}{8}$

$\frac{25 \pm 7}{8}$

How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.

$s = \sqrt{1} - 2(1) + 6$ $s = \sqrt{3} - 2(3) + 6$

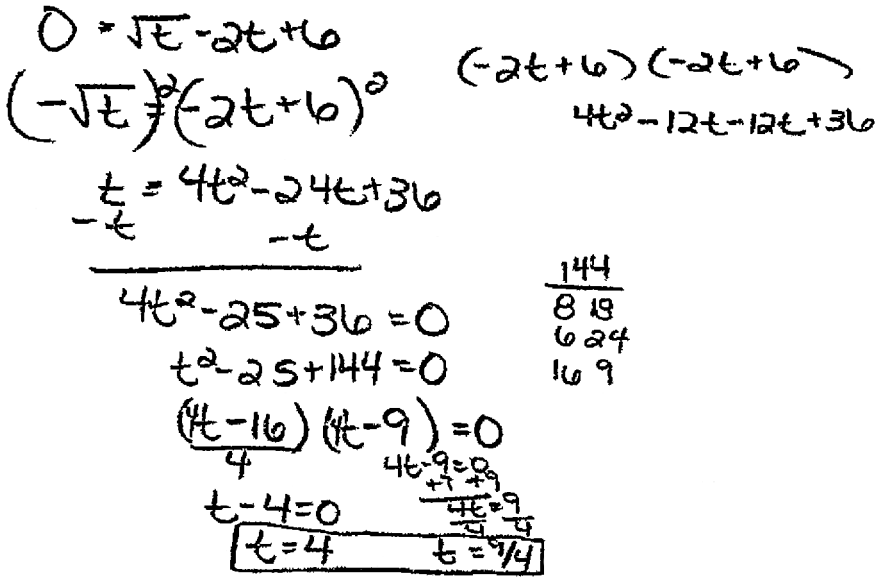
$s = 5$ $s = 1.7$

3.3 hundreds of miles per hour

Score 3: The student made more than two mechanical errors.

Question 37

37 The speed of a tidal wave, s, in hundreds of miles per hour, can be modeled by the equation $s = \sqrt{t} - 2t + 6$, where t represents the time from its origin in hours. Algebraically determine the time when $s = 0$.



How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.

several miles

Score 3: The student didn't reject $\frac{9}{4}$.

Question 37

37 The speed of a tidal wave, s, in hundreds of miles per hour, can be modeled by the equation $s = \sqrt{t} - 2t + 6$, where t represents the time from its origin in hours. Algebraically determine the time when $s = 0$.

$0 = \sqrt{t} - 2t + 6$
$-6 \quad\quad -6$
$-6^2 = \sqrt{t}^2 - 2t$
$36 = 2t - t$
$36 = t$

How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.

$s = \sqrt{1} - 2(1) + 6$
$s = 1 - 2 + 6$
$s = 500$ mph

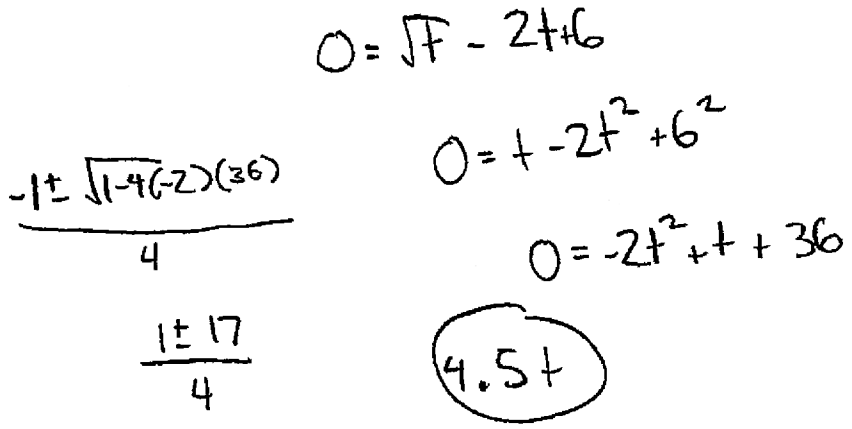
$s = \sqrt{3} - 2(3) + 6$
$s = \sqrt{3} - 6 + 6$
$s = 173$ mph

$500 - 173 = 327$
327 mph

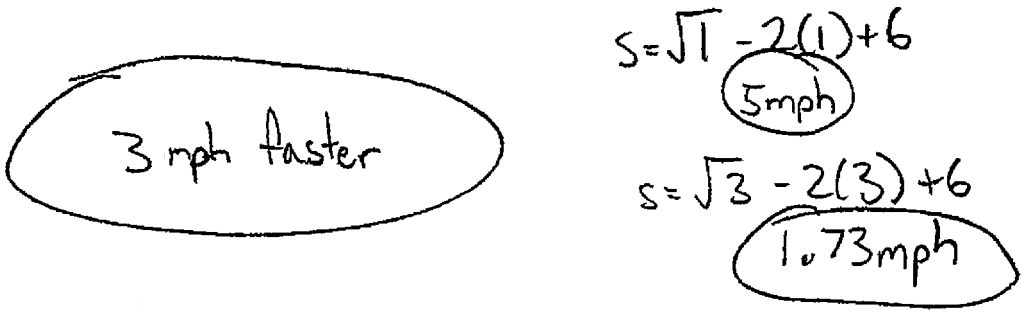
Score 2: The student found 327.

Question 37

37 The speed of a tidal wave, s, in hundreds of miles per hour, can be modeled by the equation $s = \sqrt{t} - 2t + 6$, where t represents the time from its origin in hours. Algebraically determine the time when $s = 0$.



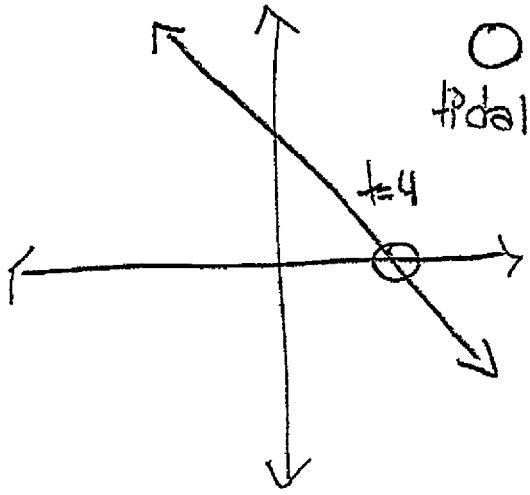
How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.



Score 1: The student did not convert to miles.

Question 37

37 The speed of a tidal wave, s, in hundreds of miles per hour, can be modeled by the equation $s = \sqrt{t} - 2t + 6$, where t represents the time from its origin in hours. Algebraically determine the time when $s = 0$.



0 is the origin time of the tidal wave when s=0

$0 = \sqrt{4} - 2(4) + 6$

$= 0$

extraneous solution

How much faster was the tidal wave traveling after 1 hour than 3 hours, to the *nearest mile per hour*? Justify your answer.

$3 = \sqrt{t} - 2(t) + 6$

$t = 2.5$

$3 = \sqrt{2.5} - 2(2.5) + 6$

$3 = 3$

$1 = \sqrt{t} - 2(t) + 6$

$1 = 3$

$1 = \sqrt{3} - 2(3) + 6$

$1 = 2$

1 mile

Score 0: The student did not show enough correct work to receive any credit.