The University of the State of New York

REGENTS HIGH SCHOOL EXAMINATION

ALGEBRA 2/ TRIGONOMETRY

Friday, January 29, 2016 — 9:15 a.m. – 12:15 p.m.

SAMPLE RESPONSE SET

Table of Contents

Question 28

28 Solve algebraically for x:

$$\sqrt{2x + 1} + 4 = 8$$

$\sqrt{2x+1} = 4$

$2x + 1 = 16$

$x = 7.5$

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

Question 28

28 Solve algebraically for x:

$\sqrt{2x+1} + 4 = 8$

$-4 \quad -4$

$(\sqrt{2x+1})^2 = (4)^2$

$2x + 1 = 16$

$2x + 1 = 16$

$-1 \quad -1$

$\frac{2x}{2} = \frac{15}{2}$

$x = 7.5$

$2x + 1 = -16$

$-1 \quad -1$

$\frac{2x}{2} = \frac{-17}{2}$

$x = -8.5$ Reject

Score 1: The student made an error by treating the square root as an absolute value.

Question 28

28 Solve algebraically for x:

$$\sqrt{2x + 1} + 4 = 8$$

$\sqrt{2x+1} + 4 = 8$

$2x + 1 + 4 = 64$

$2x = 59$

$x = 29.5$

Score 1: The student made an error when squaring both sides of the equation.

Question 28

28 Solve algebraically for x:

$$\sqrt{2x + 1} + 4 = 8$$

$\sqrt{2x+1} = 4$

$2x + 1 = 4$

$2x = 3$

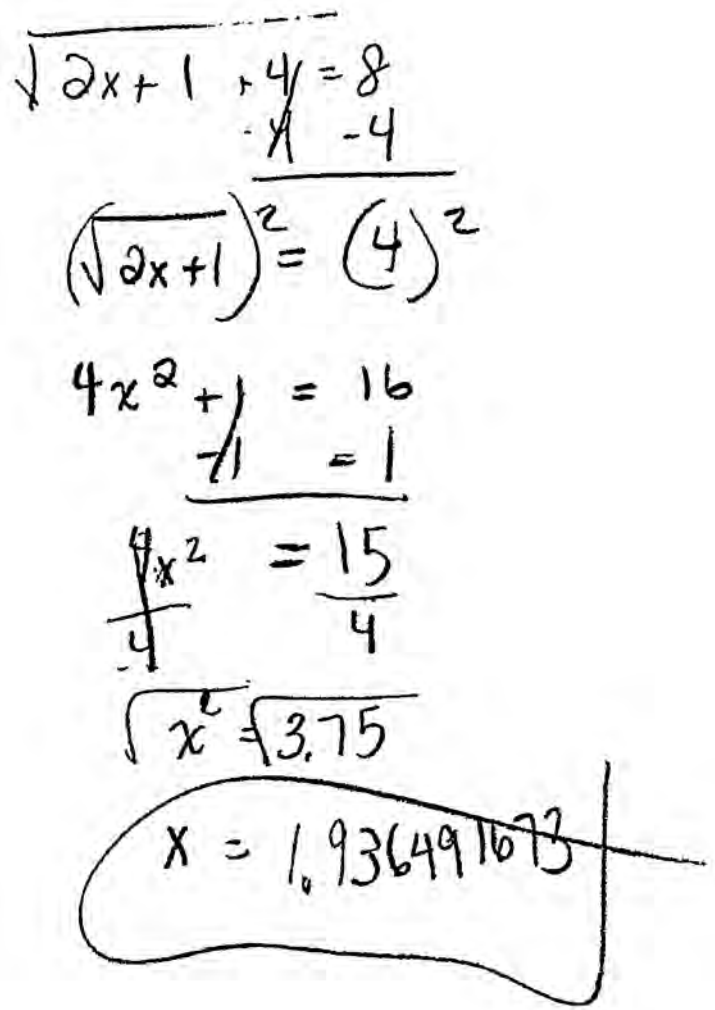
$x = \frac{3}{2}$

Score 1: The student made a conceptual error by not squaring both sides of the equation.

Question 28

28 Solve algebraically for x:

$$\sqrt{2x + 1} + 4 = 8$$

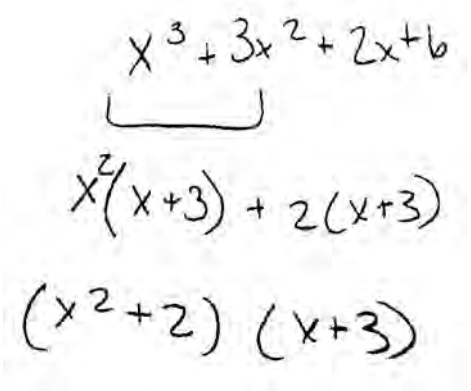


Score 0: The student made one error when squaring the radical and a second error by not stating $\pm\sqrt{3.75}$.

Question 29

29 Factor completely:

$$x^3 + 3x^2 + 2x + 6$$



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

Question 29

29 Factor completely:

$$x^3 + 3x^2 + 2x + 6$$

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

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

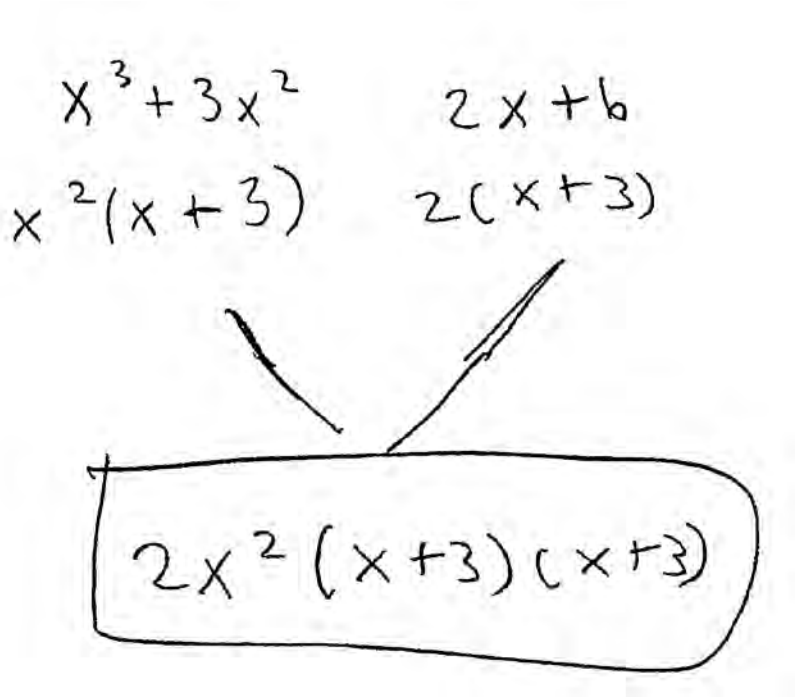
$(x-2)(x-1)(x+3)$

Score 1: The student incorrectly factored $(x^2 + 2)$.

Question 29

29 Factor completely:

$$x^3 + 3x^2 + 2x + 6$$



Score 1: The student made an error in factoring by grouping.

Question 29

29 Factor completely:

$$x^3 + 3x^2 + 2x + 6$$

x^3+3x^2+2x+6

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

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

$x^2+2=0$ $\quad$ $x+3=0$

$-2\ -2$ $\quad$ $-3\ -3$

$\sqrt{x^2}=\sqrt{-2}$ $\quad$ $x=-3$

$x=\sqrt{-2}$

Score 1: The student made an error by treating the expression as an equation.

Question 29

29 Factor completely:

$$x^3 + 3x^2 + 2x + 6$$

$X(x^2+3x+2)+6$

$(x+6)(x^2+3x+2)=0$

$(x+6)(x+2)(x+1)=0$

$x+6=0 \quad x+2=0 \quad x+1=0$

$x=-6 \quad x=-2 \quad x=-1$

Score 0: The student factored by grouping incorrectly and treated the expression as an equation.

Question 30

30 Solve algebraically for the *exact* value of x:

$$\log_8 16 = x + 1$$

$8^{x+1} = 16$

$2^{3x+3} = 2^4$

$3x + 3 = 4$

$-3 \quad -3$

$\frac{3x}{3} = \frac{1}{3}$

$x = 1/3$

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

Question 30

30 Solve algebraically for the *exact* value of x:

$$\log_8 16 = x + 1$$

$$\frac{\log 16}{\log 8} = x + 1$$

$$1.\overline{3} = x + 1$$

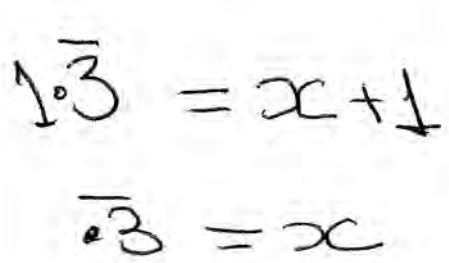
$$0.\overline{3} = x$$

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

Question 30

30 Solve algebraically for the *exact* value of x:

$$\log_8 16 = x + 1$$

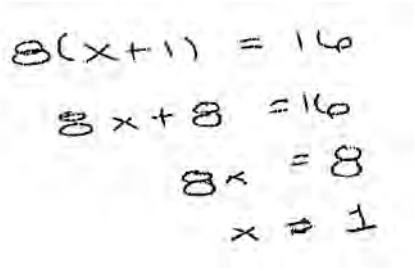


Score 2: The student has a complete and correct response.

Question 30

30 Solve algebraically for the *exact* value of x:

$$\log_8 16 = x + 1$$

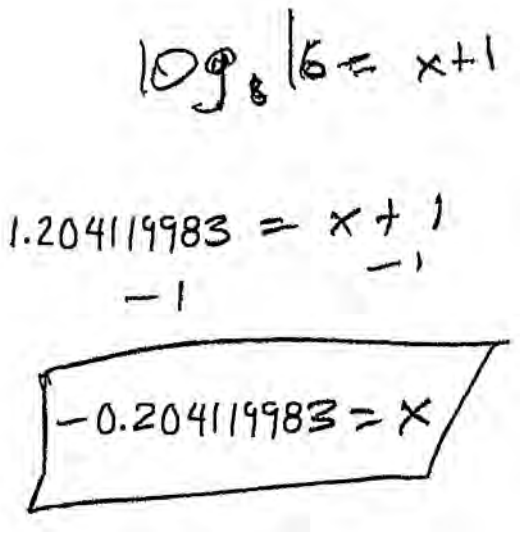


Score 1: The student made an error by not raising 8 to the power of $(x + 1)$.

Question 30

30 Solve algebraically for the *exact* value of x:

$$\log_8 16 = x + 1$$

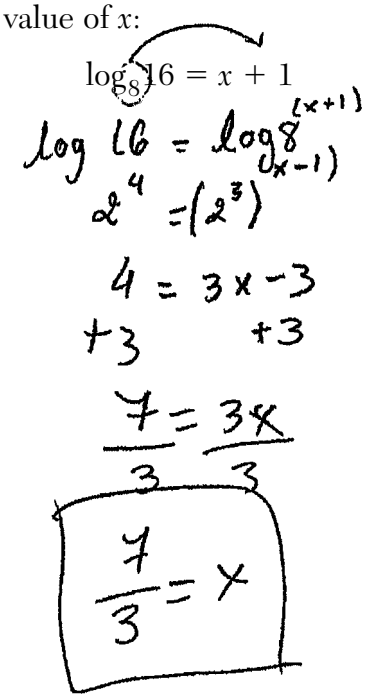


Score 1: The student made an error by calculating log16.

Question 30

30 Solve algebraically for the *exact* value of x:

$\log_8 16 = x + 1$

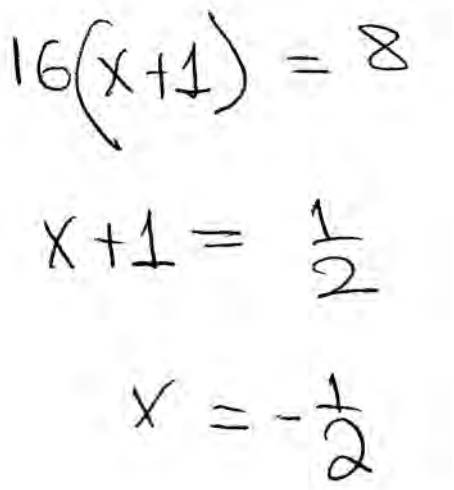


Score 1: The student made a transcription error by writing $(x - 1)$ instead of $(x + 1)$.

Question 30

30 Solve algebraically for the *exact* value of x:

$$\log_8 16 = x + 1$$



Score 0: The student wrote a completely incorrect response.

Question 31

31 Determine how many eleven-letter arrangements can be formed from the word "CATTARAUGUS."

3 A's
2 T's
2 U's

$$\frac{11!}{3!\,2!\,2!}$$

16632000

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

Question 31

31 Determine how many eleven-letter arrangements can be formed from the word "CATTARAUGUS."

$$\frac{11!}{3 \cdot 2 \cdot 2 \cdot 2} = 1,663,200$$

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

Question 31

31 Determine how many eleven-letter arrangements can be formed from the word "CATTARAUGUS."

$$\frac{11!}{3 \cdot 2 \cdot 2} = 3,326,400$$

Score 1: The student divided by an incorrect denominator.

Question 31

31 Determine how many eleven-letter arrangements can be formed from the word "CATTARAUGUS."

$$\frac{11!}{3! + 2! + 2!}$$

$$\frac{11!}{10}$$

3,991,680

Score 1: The student added in the denominator instead of multiplying.

Question 31

31 Determine how many eleven-letter arrangements can be formed from the word "CATTARAUGUS."

$11! = 39{,}916{,}800$

Score 0: The student only evaluated 11!.

Question 32

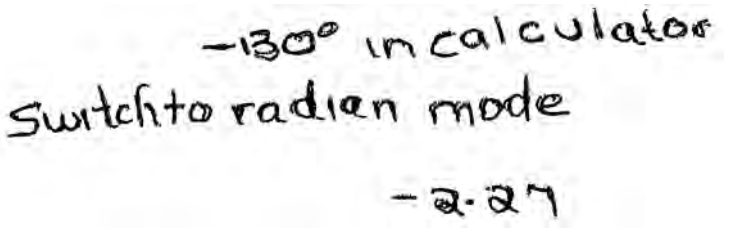
32 Express $-130°$ in radian measure, to the *nearest hundredth*.

$\frac{-130^{\circ}}{1} \cdot \frac{\pi}{180^{\circ}} = \frac{-13\pi}{18} \approx -2.27$

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

Question 32

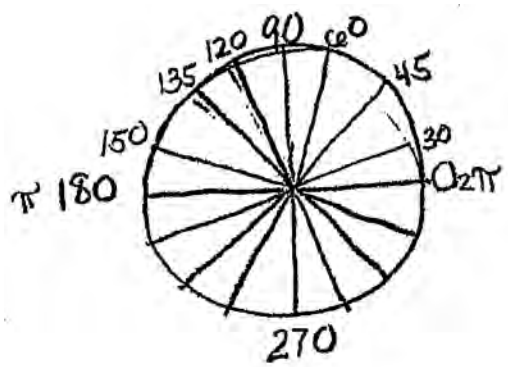
32 Express −130° in radian measure, to the *nearest hundredth*.



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

Question 32

32 Express −130° in radian measure, to the *nearest hundredth*.



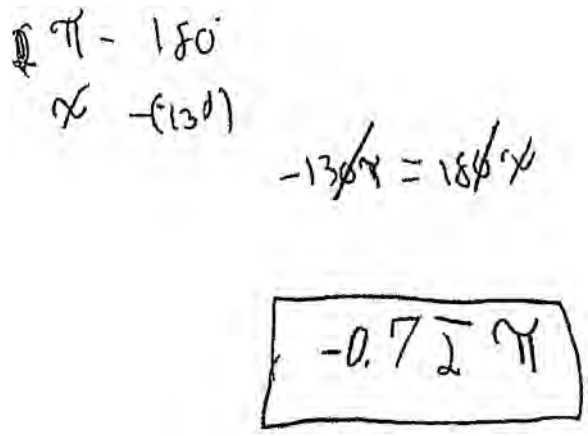
$\frac{-130}{180}$ $\frac{-13}{18}$

−.72

Score 1: The student did not include π in the formula.

Question 32

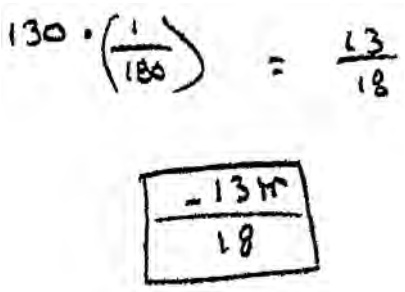
32 Express −130° in radian measure, to the *nearest hundredth*.



Score 1: The student did not express the answer to the nearest hundredth.

Question 32

32 Express −130° in radian measure, to the *nearest hundredth*.



Score 1: The student did not express the answer to the nearest hundredth.

Question 32

32 Express $-130°$ in radian measure, to the *nearest hundredth*.

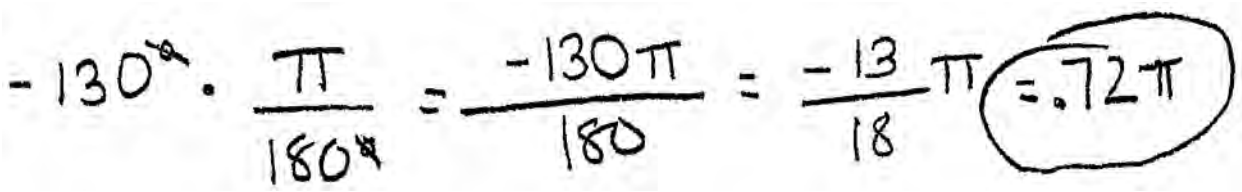
$$-130 \cdot \frac{\pi}{180} = \frac{-130\pi}{180} = -\frac{13\pi}{18} =$$

$$= -2.27\pi$$

Score 1: The student incorrectly included π in the final answer.

Question 32

32 Express −130° in radian measure, to the *nearest hundredth*.



Score 0: The student made an error when dividing −13 by 18 and did not express the answer to the nearest hundredth.

Question 32

32 Express −130° in radian measure, to the *nearest hundredth*.

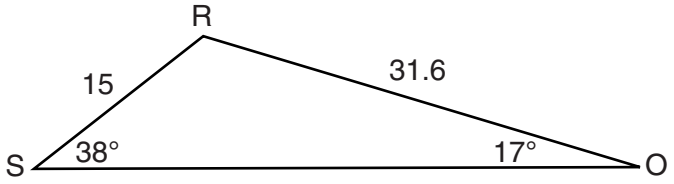
$$\frac{-130 \cdot 180}{\pi}$$

$$\frac{-23400}{\pi} = -7448.451337$$

Score 0: The student used the wrong conversion and did not round to the nearest hundredth.

Question 33

33 Determine the area, to the *nearest integer*, of $\triangle SRO$ shown below.



$K = \frac{1}{2}ab\sin C$

$K = \frac{1}{2}(15)(31.6)\sin 125$

$K = 194.139035$

$K = 194$

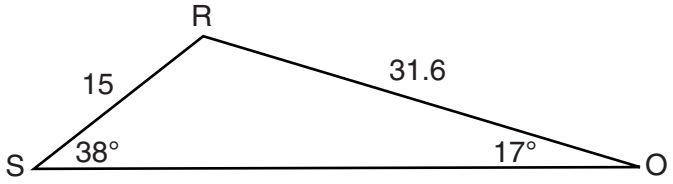
38
+17
55

180
−55
125

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

Question 33

33 Determine the area, to the *nearest integer*, of $\triangle SRO$ shown below.



$180-(38+17)=125$

$A=15(31.6)\sin 125$

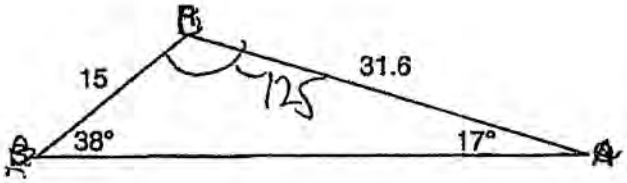
388.278069

$A\approx 388$

Score 1: The student did not divide by 2.

Question 33

33 Determine the area, to the *nearest integer*, of $\triangle SRO$ shown below.



$\frac{1}{2}ab\sin($

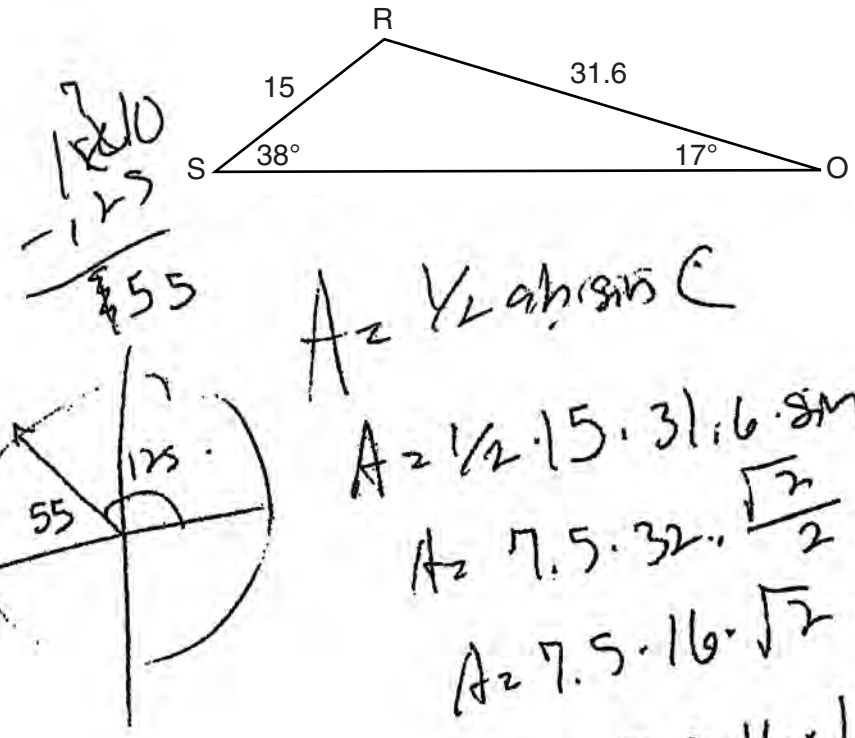
$\frac{1}{2}(15)(31.6)\sin(125)$

$K = 194.13$

Score 1: The student did not round to the nearest integer.

Question 33

33 Determine the area, to the *nearest integer*, of $\triangle SRO$ shown below.



$A = \frac{1}{2}ab\sin C$

$A = \frac{1}{2} \cdot 15 \cdot 31.6 \cdot \sin(125)$

$A = 7.5 \cdot 32 \cdot \frac{\sqrt{2}}{2}$

$A = 7.5 \cdot 16 \cdot \sqrt{2}$

$A = 7.5 \cdot 16 \cdot 1$

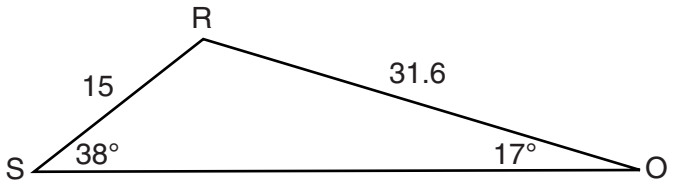
$A = 8 \cdot 16$

128

Score 1: The student substituted correctly into the area formula.

Question 33

33 Determine the area, to the *nearest integer*, of $\triangle SRO$ shown below.



$A = \frac{1}{2}bh$

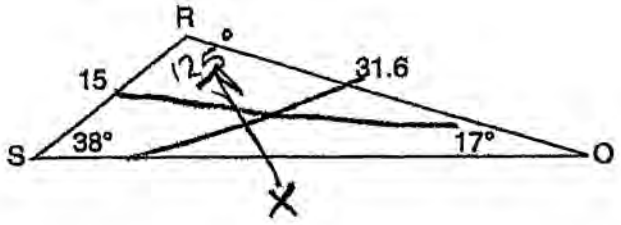
$= \frac{1}{2} \times 15 \times 31.6$

$= 237$

Score 0: The student used the incorrect formula.

Question 33

33 Determine the area, to the *nearest integer*, of $\triangle SRO$ shown below.



$\frac{x}{\sin 125^\circ} = \frac{31.6}{\sin 38^\circ}$

$25.885 =$

42.0445

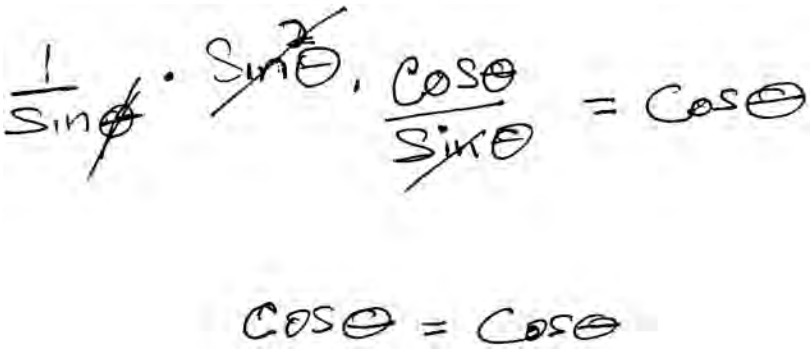
42

Score 0: The student wrote irrelevant work.

Question 34

34 Prove that the equation shown below is an identity for all values for which the functions are defined:

$$\csc \theta \bullet \sin^2 \theta \bullet \cot \theta = \cos \theta$$



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

Question 34

34 Prove that the equation shown below is an identity for all values for which the functions are defined:

$$\csc \theta \bullet \sin^2 \theta \bullet \cot \theta = \cos \theta$$

$\frac{1}{\sin 30} \sin^2 30 \frac{1}{\tan 30} = \cos 30$

$(2)(.25)(1.732050808) = .866024038$

$(.5)(1.732) = .866$

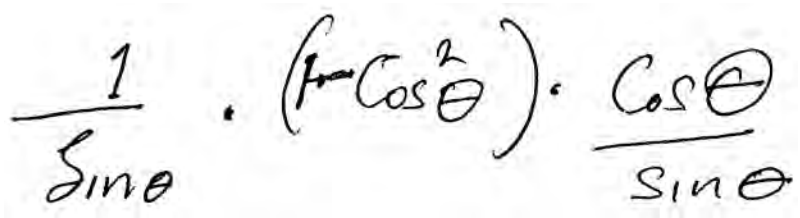
$.866 = .866$

Score 1: The student did not prove the equation works for all values of θ.

Question 34

34 Prove that the equation shown below is an identity for all values for which the functions are defined:

$$\csc \theta \bullet \sin^2 \theta \bullet \cot \theta = \cos \theta$$



Score 1: The student wrote all the trigonometric functions in terms of sin θ and cos θ, but showed no further correct work.

Question 34

34 Prove that the equation shown below is an identity for all values for which the functions are defined:

$$\csc\theta \cdot \sin^2\theta \cdot \cot\theta = \cos\theta$$

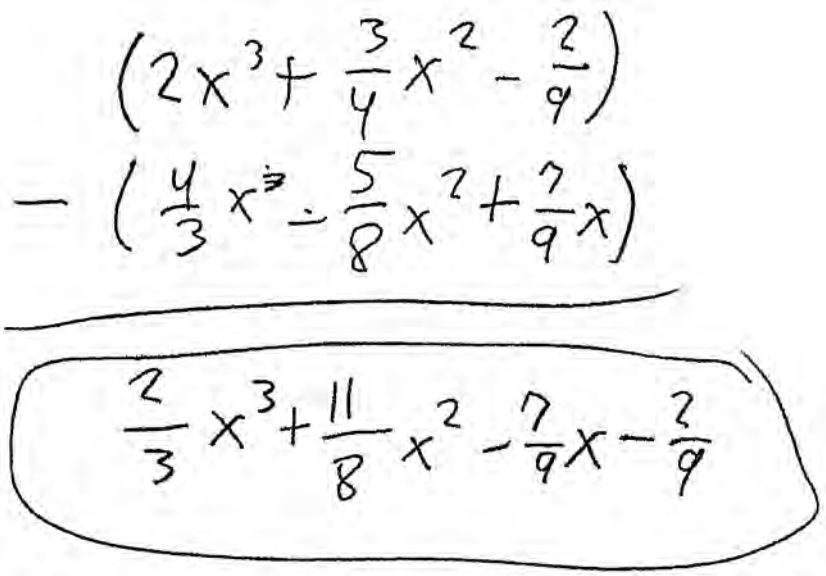
$$\left(\frac{1}{\sin\theta}\right)(\sin^2\theta)\left(\frac{\sin\theta}{\cos\theta}\right) = \cos\theta$$

$$\sin^2\theta + \cos^2\theta = 1$$

Score 0: The student did not substitute for cot θ correctly and showed no further correct work.

Question 35

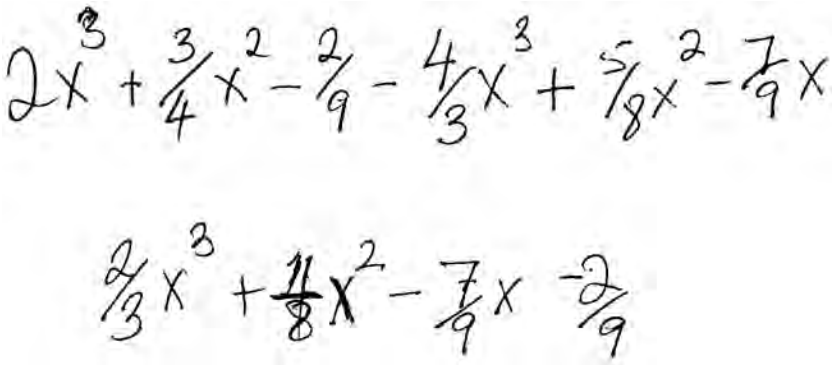
35 Find the difference when $\frac{4}{3}x^3 - \frac{5}{8}x^2 + \frac{7}{9}x$ is subtracted from $2x^3 + \frac{3}{4}x^2 - \frac{2}{9}$.



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

Question 35

35 Find the difference when $\frac{4}{3}x^3 - \frac{5}{8}x^2 + \frac{7}{9}x$ is subtracted from $2x^3 + \frac{3}{4}x^2 - \frac{2}{9}$.



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

Question 35

35 Find the difference when $\frac{4}{3}x^3 - \frac{5}{8}x^2 + \frac{7}{9}x$ is subtracted from $2x^3 + \frac{3}{4}x^2 - \frac{2}{9}$.

$$\left(2x^3 + \frac{3}{4}x^2 - \frac{2}{9}\right) - \left(\frac{4}{3}x^3 - \frac{5}{8}x^2 + \frac{7}{9}\right)$$

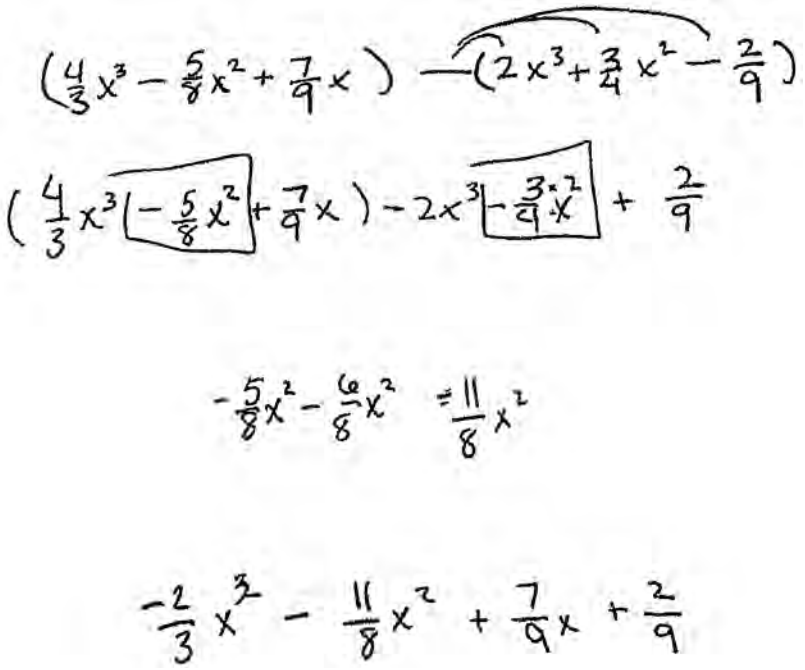
$$2x^3 + \frac{3}{4}x^2 - \frac{2}{9} - \frac{4}{3}x^3 + \frac{5}{8}x^2 - \frac{7}{9}$$

$$\frac{2}{3}x^3 + \frac{11}{8}x^2 - 1$$

Score 1: The student made a transcription error by not writing $-\frac{7}{9}x$.

Question 35

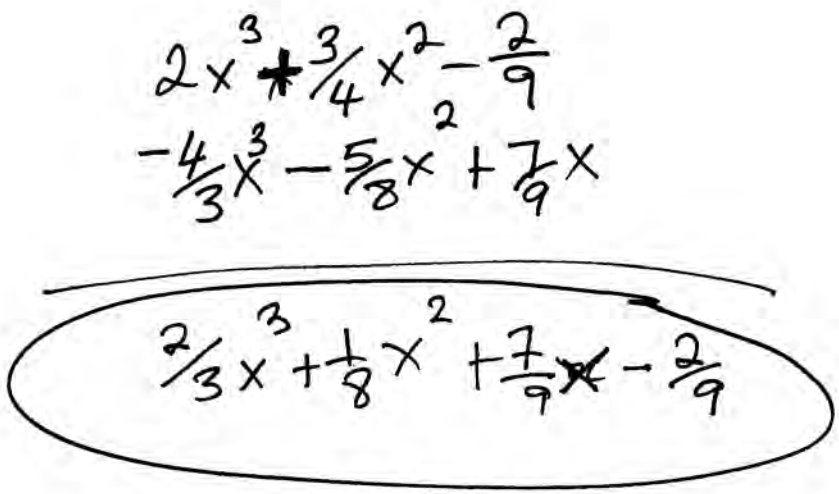
35 Find the difference when $\frac{4}{3}x^3 - \frac{5}{8}x^2 + \frac{7}{9}x$ is subtracted from $2x^3 + \frac{3}{4}x^2 - \frac{2}{9}$.



Score 1: The student subtracted in the wrong order.

Question 35

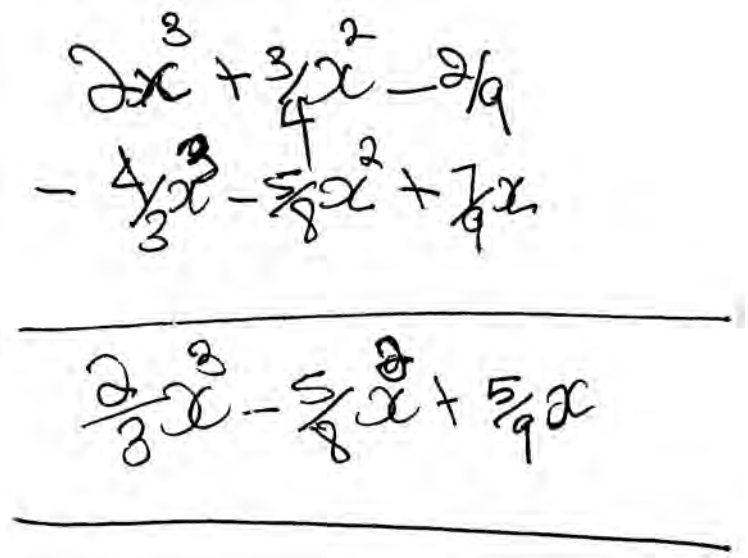
35 Find the difference when $\frac{4}{3}x^3 - \frac{5}{8}x^2 + \frac{7}{9}x$ is subtracted from $2x^3 + \frac{3}{4}x^2 - \frac{2}{9}$.



Score 1: The student did not distribute the negative.

Question 35

35 Find the difference when $\frac{4}{3}x^3 - \frac{5}{8}x^2 + \frac{7}{9}x$ is subtracted from $2x^3 + \frac{3}{4}x^2 - \frac{2}{9}$.



Score 0: The student did not distribute the negative and combined unlike terms.

Question 36

36 Find the exact roots of $x^2 + 10x - 8 = 0$ by completing the square.

$(x^2 + 10x + 25) - 8 = 0$,25

$(x+5)^2 - 33 = 0$

$(x+5)^2 = 33$

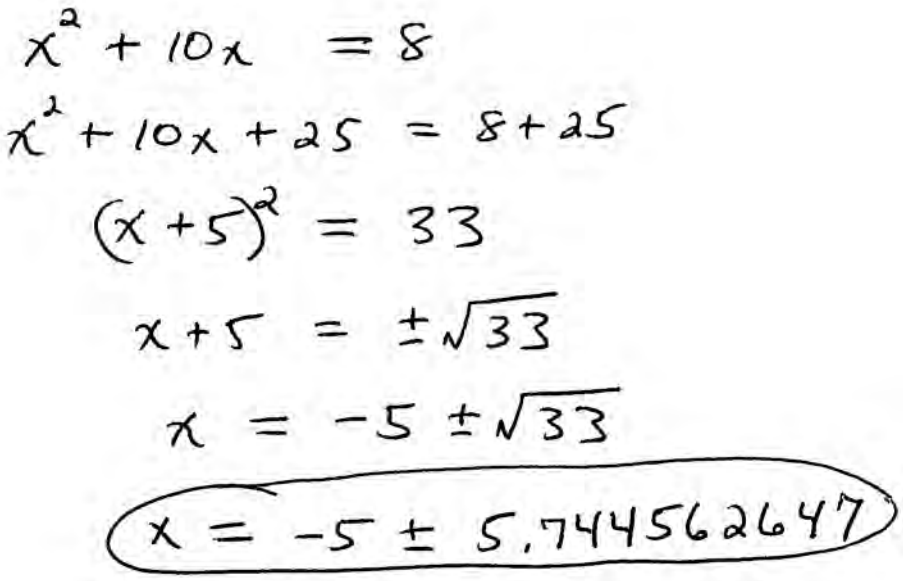
$x+5 = \pm\sqrt{33}$

$x = -5 \pm \sqrt{33}$

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

Question 36

36 Find the exact roots of $x^2 + 10x - 8 = 0$ by completing the square.



Score 3: The student did not give the exact values of x as the final answer.

Question 36

36 Find the exact roots of $x^2 + 10x - 8 = 0$ by completing the square.

$x^2 + 10x - 8 = 0$

$+8 \quad +8$

$x^2 + 10x = 8$

$x^2 + 10x + 25 = 8 + 25$

$(x + 5)^2 = 33$

$\sqrt{(x + 5)^2} = \sqrt{33}$

$x + 5 = \sqrt{33}$

$x = \sqrt{33} - 5$

Score 3: The student did not write $\pm\sqrt{33}$.

Question 36

36 Find the exact roots of $x^2 + 10x - 8 = 0$ by completing the square.

$x^2 + 10x = 8$

$x^2 + 10x + 25 = 8 - 25$

$(x+5)^2 = -17$

$x + 5 = \pm\sqrt{-17}$

$x = -5 \pm i\sqrt{17}$

Score 2: The student made a conceptual error by adding 25 to the left and subtracting 25 from the right.

Question 36

36 Find the exact roots of $x^2 + 10x - 8 = 0$ by completing the square.

$x^2 + 10x - 8 = 0$

$a = 1 \quad b = 10 \quad c = -8$

$$x = \frac{-10 \pm \sqrt{100 - (-32)}}{2}$$

$$x = \frac{-10 \pm \sqrt{132}}{2}$$

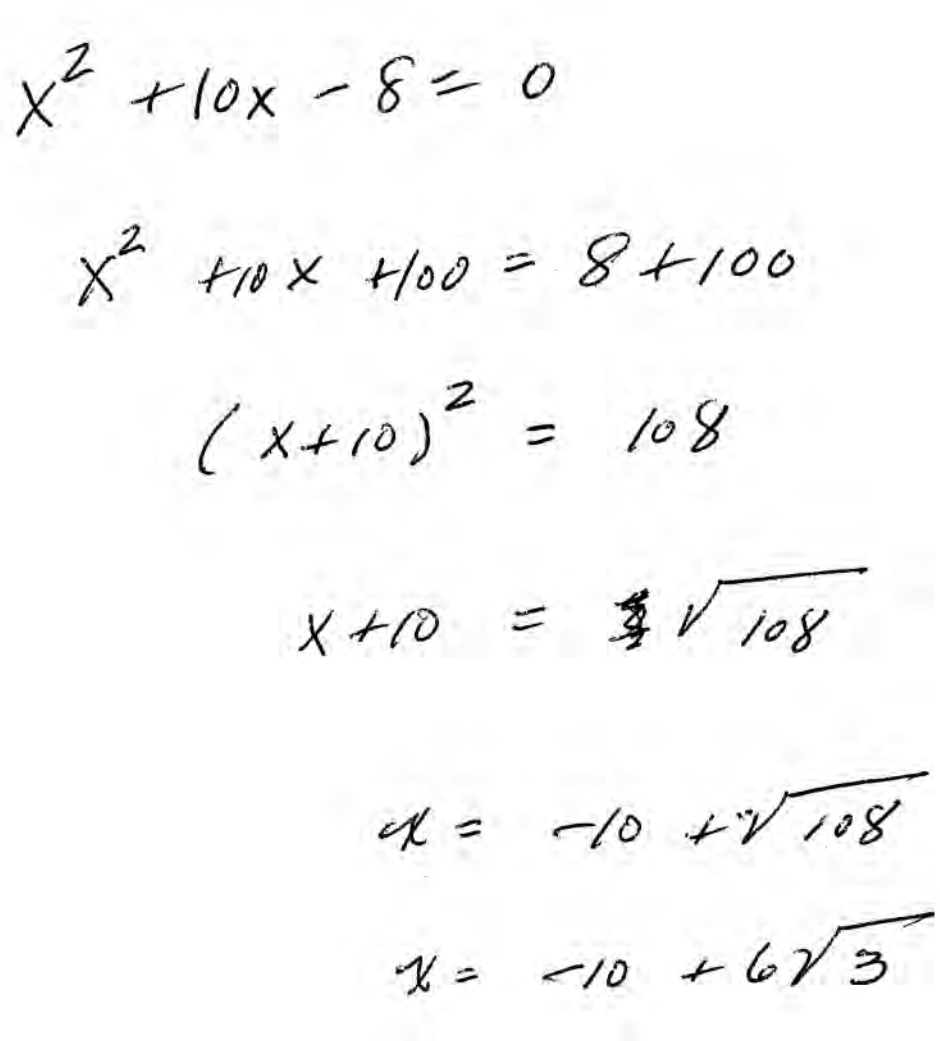
$$x = \frac{-10 \pm 2\sqrt{33}}{2}$$

$$x = -5 \pm \sqrt{33}$$

Score 2: The student used the quadratic formula to solve for x.

Question 36

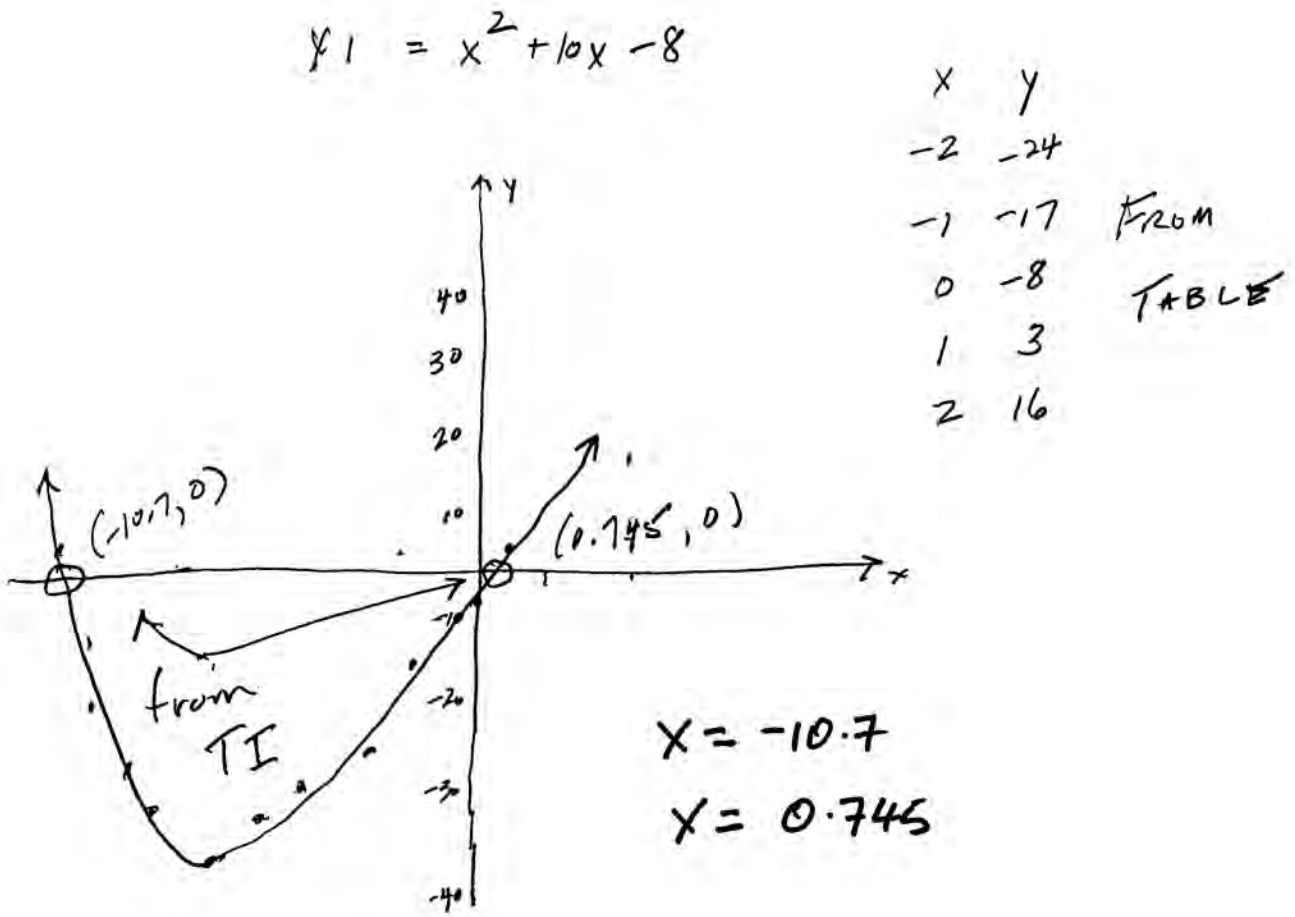
36 Find the exact roots of $x^2 + 10x - 8 = 0$ by completing the square.



Score 1: The student made a conceptual error in completing the square by adding 100 to both sides and not writing $\pm\sqrt{108}$.

Question 36

36 Find the exact roots of $x^2 + 10x - 8 = 0$ by completing the square.



Score 1: The student used a method other than completing the square and did not give exact values of x.

Question 36

36 Find the exact roots of $x^2 + 10x - 8 = 0$ by completing the square.

$a = 1 \quad b = 10 \quad c = -8$

$$x = \frac{-10 \pm \sqrt{10^2 - 4(1)(-8)}}{2(1)}$$

$$x = \frac{-10 \pm \sqrt{132}}{2}$$

$x = .7445626565$

$x = -10.7445626565$

Score 1: The student used the quadratic formula and did not give the exact value of x.

Question 36

36 Find the exact roots of $x^2 + 10x - 8 = 0$ by completing the square.

$x^2 + 10x = 8$

$x^2 + 10x + 25 = 8$

$(x+5)(x+5) = 8$

$(x+5)^2 = 8^2$

$(x+5)^2 = 64$

$(x+5)^2 - 64 = 0$

Score 0: The student made a conceptual error by not adding 25 to both sides of the equation and another conceptual error by squaring the 8. The student also did not solve for x.

Question 37

37 The table below gives the relationship between x and y.

x	1	2	3	4	5
y	4.2	33.5	113.1	268.1	523.6

Use exponential regression to find an equation for y as a function of x, rounding all values to the *nearest hundredth*.

$y = 2.19 \cdot (3.23)^x$

Using this equation, predict the value of x if y is 426.21, rounding to the *nearest tenth*. [Only an algebraic solution can receive full credit.]

$426.21 = 2.19 \cdot (3.23)^x$

$194.62 = 3.23^x$

$\log_{3.23} 194.62 = x$

$x = 4.5$

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

Question 37

37 The table below gives the relationship between x and y.

x	1	2	3	4	5
y	4.2	33.5	113.1	268.1	523.6

Use exponential regression to find an equation for y as a function of x, rounding all values to the *nearest hundredth*.

Using this equation, predict the value of x if y is 426.21, rounding to the *nearest tenth*. [Only an algebraic solution can receive full credit.]

$y = a(B^x)$

$a = 2.19$

$B = 3.23$

$426.21 = 2.19(3.23^x)$

$194.61643\,84 = 3.23^x$

$\log 194.61643\,84 = x \log 3.23$

$x = 4.49\,5617\,009$

$x = 4.5$

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

Question 37

37 The table below gives the relationship between x and y.

x	1	2	3	4	5
y	4.2	33.5	113.1	268.1	523.6

Use exponential regression to find an equation for y as a function of x, rounding all values to the *nearest hundredth*.

Using this equation, predict the value of x if y is 426.21, rounding to the *nearest tenth*. [Only an algebraic solution can receive full credit.]

$y = ab^x$

$a = 8.26$

$b = 2.32$

$$\frac{426.21}{8.26} = \frac{8.26 \cdot 2.32^x}{8.26}$$

$$51.599 = 2.32^x$$

$$\frac{\log 51.599}{\log 2.32} = \frac{x \cdot \log 2.32}{\log 2.32}$$

$x = 4.6859$

$\boxed{x = 4.7}$

Score 3: The student solved an incorrect exponential regression equation appropriately.

Question 37

37 The table below gives the relationship between x and y.

x	1	2	3	4	5
y	4.2	33.5	113.1	268.1	523.6

Use exponential regression to find an equation for y as a function of x, rounding all values to the *nearest hundredth*.

$y = 2.19(3.23)^x$

Using this equation, predict the value of x if y is 426.21, rounding to the *nearest tenth*. [Only an algebraic solution can receive full credit.]

$426.21 = 2.19(3.23)^x$

Score 2: The student did not solve for x.

Question 37

37 The table below gives the relationship between x and y.

x	1	2	3	4	5
y	4.2	33.5	113.1	268.1	523.6

Use exponential regression to find an equation for y as a function of x, rounding all values to the *nearest hundredth*.

$y = ab^x$
$a \approx 2.19$ $b \approx 3.23$ $y = 2.19 * 3.23^x$

Using this equation, predict the value of x if y is 426.21, rounding to the *nearest tenth*. [Only an algebraic solution can receive full credit.]

$426.21 = 2.19(3.23)^x$

$\log 426.21 = \log 2.19(3.23)^x$

$\log 426.21 = x \log 2.19(3.23)$

$\frac{\log 426.21}{\log 2.19(3.23)} = x$

$3.1 = x$

Score 2: The student wrote a correct exponential regression equation, but made a conceptual error by not applying the product rule.

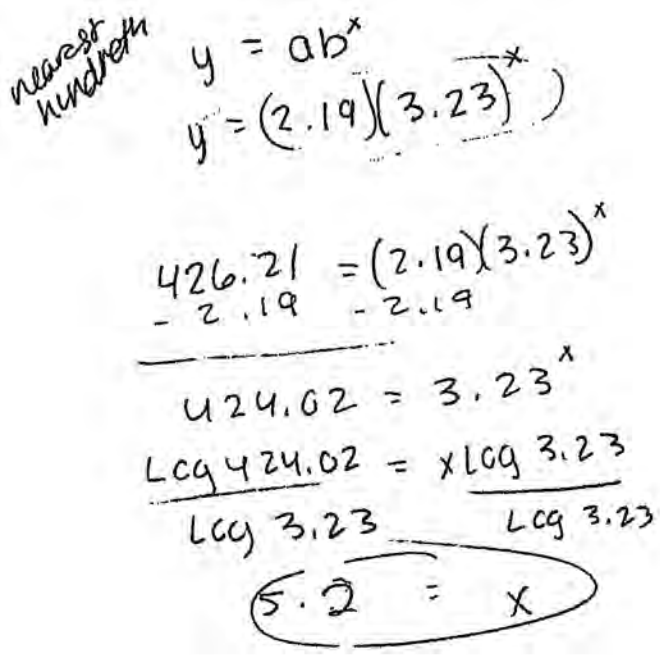
Question 37

37 The table below gives the relationship between x and y.

x	1	2	3	4	5
y	4.2	33.5	113.1	268.1	523.6

Use exponential regression to find an equation for y as a function of x, rounding all values to the *nearest hundredth*.

Using this equation, predict the value of x if y is 426.21, rounding to the *nearest tenth*. [Only an algebraic solution can receive full credit.]



Score 2: The student wrote a correct exponential regression equation, but made a conceptual error by subtracting 2.19 instead of dividing.

Question 37

37 The table below gives the relationship between x and y.

x	1	2	3	4	5
y	4.2	33.5	113.1	268.1	523.6

Use exponential regression to find an equation for y as a function of x, rounding all values to the *nearest hundredth*.

$y = a \cdot b^x$ $y = .71(4.05)^x$

Using this equation, predict the value of x if y is 426.21, rounding to the *nearest tenth*. [Only an algebraic solution can receive full credit.]

$$\frac{426.21}{.71} = \frac{.71(4.05)^x}{.71}$$

$$600.2957746 = (4.05)^x$$

$$\frac{\ln 600.2957746}{\ln 4.05} = \frac{x \ln 4.05}{\ln 4.05}$$

$x = 4.573779424$

$x = 4.57$

Score 2: The student solved an incorrect exponential regression equation appropriately, but did not round 4.57 to the nearest tenth.

Question 37

37 The table below gives the relationship between x and y.

x	1	2	3	4	5
y	4.2	33.5	113.1	268.1	523.6

Use exponential regression to find an equation for y as a function of x, rounding all values to the *nearest hundredth*.

$y = 8.26(2.32)^x$

Using this equation, predict the value of x if y is 426.21, rounding to the *nearest tenth*. [Only an algebraic solution can receive full credit.]

Score 1: The student wrote an incorrect exponential regression equation.

Question 37

37 The table below gives the relationship between x and y.

x	1	2	3	4	5
y	4.2	33.5	113.1	268.1	523.6

Use exponential regression to find an equation for y as a function of x, rounding all values to the *nearest hundredth*.

Using this equation, predict the value of x if y is 426.21, rounding to the *nearest tenth*. [Only an algebraic solution can receive full credit.]

$y = a \cdot b^x$

$a = 8.26$

$b = 2.32$

$\frac{426.21}{8.26} = \frac{8.26 \cdot 2.32^x}{8.26}$

$\frac{51.6}{2.32} = \frac{2.32^x}{2.32}$

22.2

Score 1: The student solved an incorrect exponential equation, but made a conceptual error by dividing by 2.32.

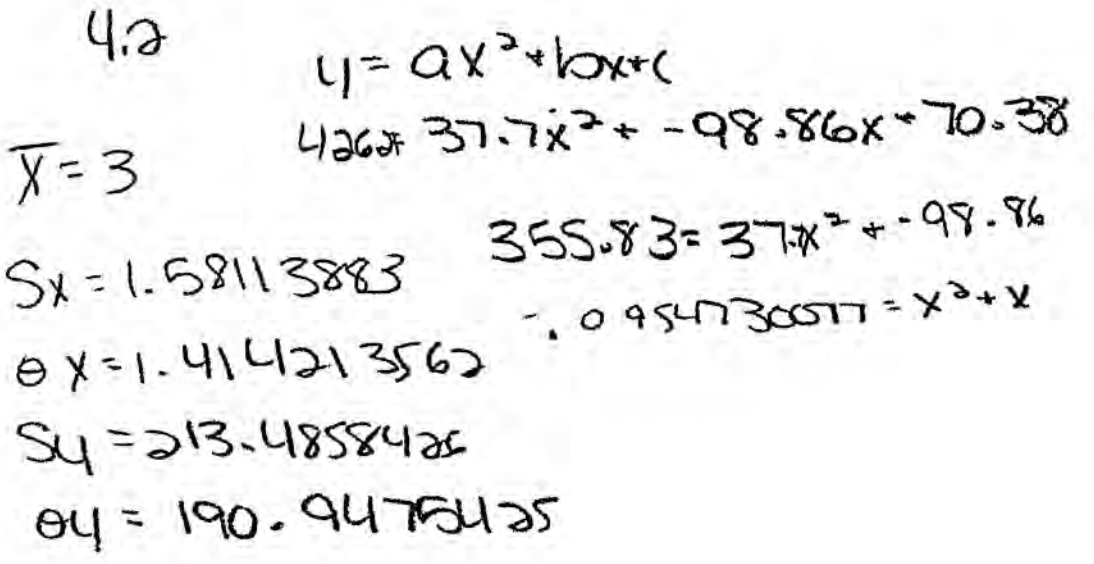
Question 37

37 The table below gives the relationship between x and y.

x	1	2	3	4	5
y	4.2	33.5	113.1	268.1	523.6

Use exponential regression to find an equation for y as a function of x, rounding all values to the *nearest hundredth*.

Using this equation, predict the value of x if y is 426.21, rounding to the *nearest tenth*. [Only an algebraic solution can receive full credit.]



Score 0: The student wrote completely incorrect work.

Question 38

38 Solve the equation $\cos 2x = \cos x$ algebraically for all values of x in the interval $0° \leq x < 360°$.

$2\cos^2 x - 1 = \cos x$

$2\cos^2 x - \cos x - 1 = 0$

$a = 2 \quad b = -1 \quad c = -1$

$\cos x = \dfrac{1 \pm \sqrt{1 - (-8)}}{4} = \dfrac{1 \pm \sqrt{9}}{4}$

$\cos x = \dfrac{1 \pm 3}{4}$

$\cos x = \dfrac{1+3}{4} = 1$

$x = \arccos(1)$

$x = 0$

$\cos x = \dfrac{1-3}{4} = -\dfrac{1}{2}$

QII, III; 60

$x = \arccos\left(-\dfrac{1}{2}\right)$

$x = 120, 240$

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

Question 38

38 Solve the equation $\cos 2x = \cos x$ algebraically for all values of x in the interval $0° \leq x < 360°$.

$\cos 2x = \cos x$

$2\cos^2 x - 1 = \cos x$

$2\cos^2 x - \cos x - 1 = 0$

$(2\cos x + 1)(\cos x - 1) = 0$

$\cos x = -\frac{1}{2}$ $\quad$ $\cos x = 1$

$x = 120$ $\quad$ 0

240

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

Question 38

38 Solve the equation $\cos 2x = \cos x$ algebraically for all values of x in the interval $0° \leq x < 360°$.

$\cos 2x = \cos x$

$2\cos^2 x - 1 = \cos x$

$2\cos^2 x - \cos x - 1 = 0$

$(2\cos x - 1)(\cos x + 1) = 0$

$2\cos x - 1 = 0$ | $\cos x + 1 = 0$

$\cos x = \frac{1}{2}$ | $\cos x = -1$

$x = 60°$ and $300°$ $\quad x = 180°$

$x = 60°, 180°, 300°$

Score 3: The student made one factoring error.

Question 38

38 Solve the equation $\cos 2x = \cos x$ algebraically for all values of x in the interval $0° \leq x < 360°$.

$\cos 2x = \cos x$

$2\cos^2 x - 1 = \cos x$

$2\cos^2 x - \cos x - 1 = 0$

$(2\cos x + 1)(\cos x - 1) = 0$

$2\cos x + 1 = 0$ | $\cos x - 1 = 0$

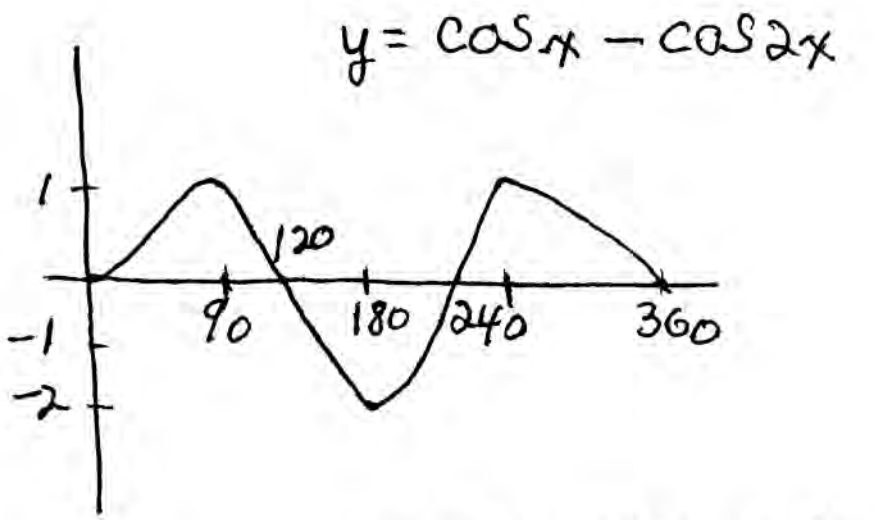
$\cos x = -\frac{1}{2}$ | $\cos x = 1$

$x = 120 \text{ \& } 240$ $\quad$ $x = 0 \text{ \& } 360$

Score 3: The student stated a value that is not included in the domain.

Question 38

38 Solve the equation $\cos 2x = \cos x$ algebraically for all values of x in the interval $0° \leq x < 360°$.



$x = 0, 120, 240$

Score 2: The student used a method other than algebraic.

Question 38

38 Solve the equation $\cos 2x = \cos x$ algebraically for all values of x in the interval $0° \leq x < 360°$.

$\cos 2x = \cos x$

$-\cos x \quad -\cos x$

$\cos x = 0$

$x = \cos^{-1}(0)$

$= 90°, 270$

Score 2: The student made a conceptual error by subtracting cos x.

Question 38

38 Solve the equation $\cos 2x = \cos x$ algebraically for all values of x in the interval $0° \leq x < 360°$.

$2 \sin x \cos x - \cos x = 0$

$\cos x (2 \sin x - 1) = 0$

$\cos x = 0$ $\quad \sin x = \frac{1}{2}$

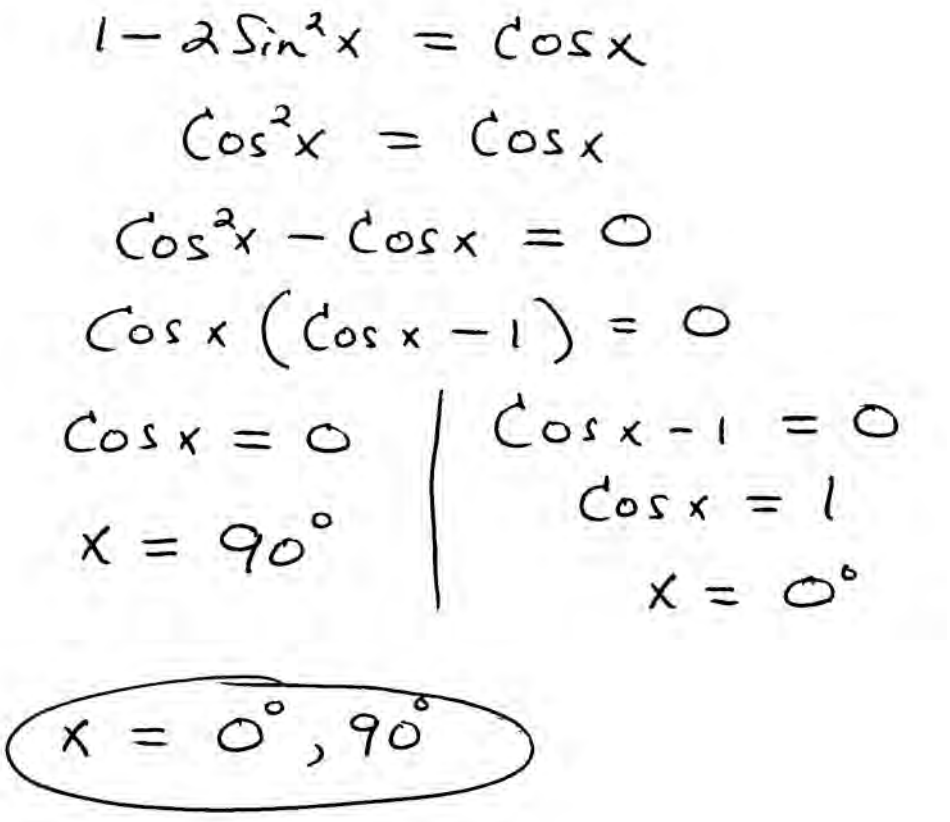
$\alpha = 30$ I, II

30, 150, 270

Score 1: The student made a conceptual error by using the formula for sin $2x$ and did not find all values of x.

Question 38

38 Solve the equation $\cos 2x = \cos x$ algebraically for all values of x in the interval $0° \leq x < 360°$.



Score 1: The student made a conceptual error when replacing $1 - 2\sin^2 x$ with $\cos^2 x$ and did not find all the values of x.

Question 38

38 Solve the equation $\cos 2x = \cos x$ algebraically for all values of x in the interval $0° \leq x < 360°$.

$$\frac{2 \sin x \cos x}{\cos x} = \frac{\cos x}{\cos x}$$

$$2 \sin x = 1$$

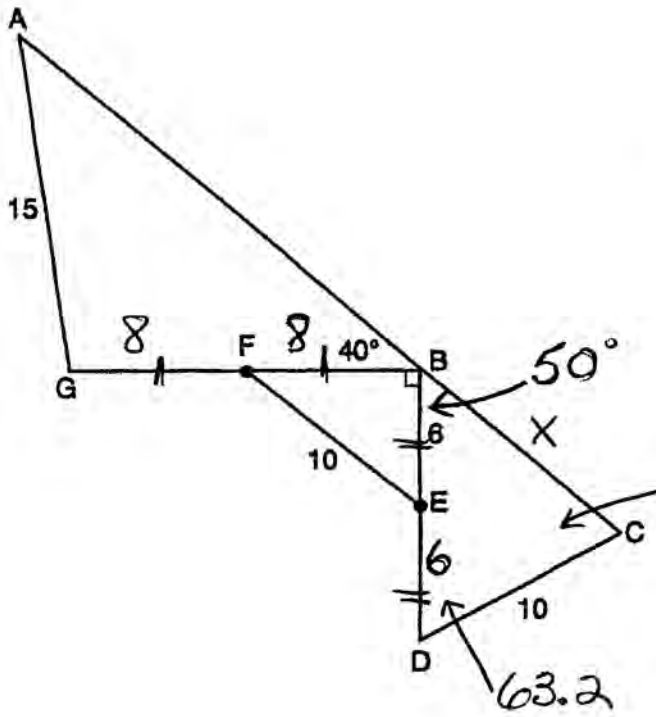
$$\sin x = \frac{1}{2}$$

$$x = 30$$

Score 0: The student made conceptual errors by using an incorrect substitution for $\cos 2x$ and then dividing both sides by $\cos x$. The student did not find all values of x.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



$\frac{10}{\sin 50} = \frac{12}{\sin C}$

$\sin C = .91925$

$C = 66.8$

$\frac{X}{\sin 63.2} = \frac{12}{\sin 66.8}$

$X = 11.65$

$X = 11.7$

Find $m\angle A$ to the *nearest tenth*.

Find BC to the *nearest tenth*.

$\frac{16}{\sin A} = \frac{15}{\sin 40}$

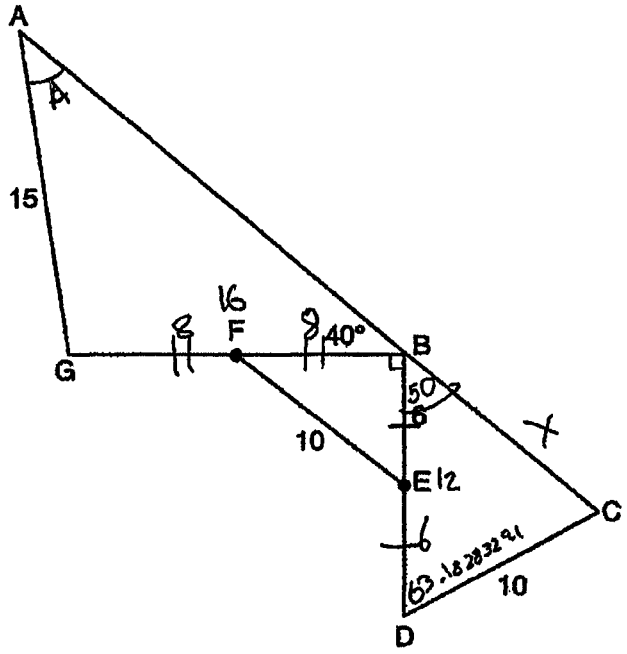
$\sin A = .6856$

$A = 43.28$ $A = 43.3$

Score 6: The student has a complete and correct response.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



$10^2 = 6^2 + x^2$

$100 = 36 + x^2$

$x = 8$

$\frac{15}{\sin 40} = \frac{16}{\sin A}$

$m\angle A = 43.3°$

$\frac{10}{\sin 50} = \frac{12}{\sin C}$

$\frac{10}{\sin 50} = \frac{x}{\sin 63.18283291}$

$BC = 11.7$

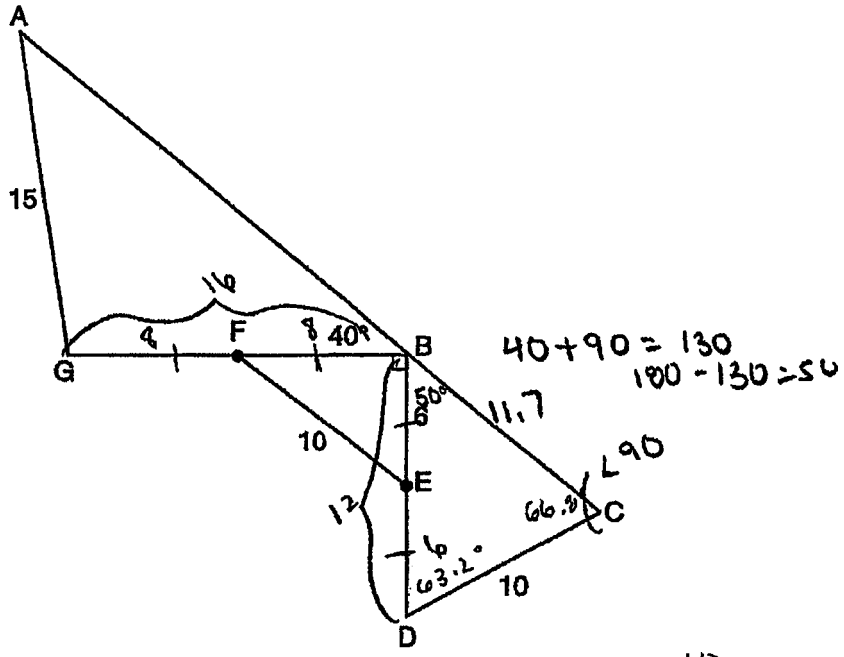
Find $m\angle A$ to the *nearest tenth*.

Find BC to the *nearest tenth*.

Score 6: The student has a complete and correct response.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



40+90 = 130
180 - 130 = 50

$\frac{10}{\sin 50°} = \frac{12}{\sin C} = 66.8°$

$180 - 66.8 - 50 = 63.2° = m\angle D$

Find $m\angle A$ to the *nearest tenth*.

$\frac{15}{\sin 40°} = \frac{16}{\sin x}$

$x = 43.2$

$m\angle A = 43.2°$

Find BC to the *nearest tenth*.

$\frac{x}{\sin 63.2} = \frac{10}{\sin 50°}$

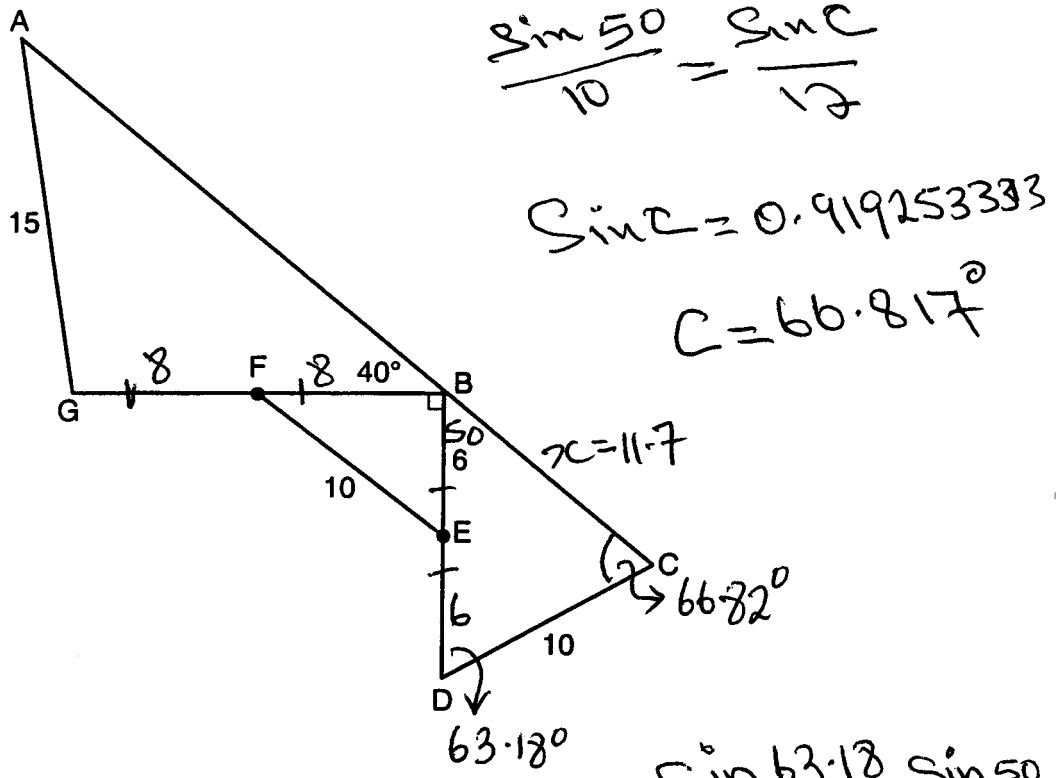
$x = 11.7$

$\boxed{BC = 11.7}$

Score 5: The student made one rounding error in $m\angle A$.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



$\frac{\sin 50}{10} = \frac{\sin C}{12}$

$\sin C = 0.919253333$

$C = 66.817^\circ$

$x = 11.7$

$\frac{\sin 63.18}{x} = \frac{\sin 50}{10}$

$x = 11.65$

11.7

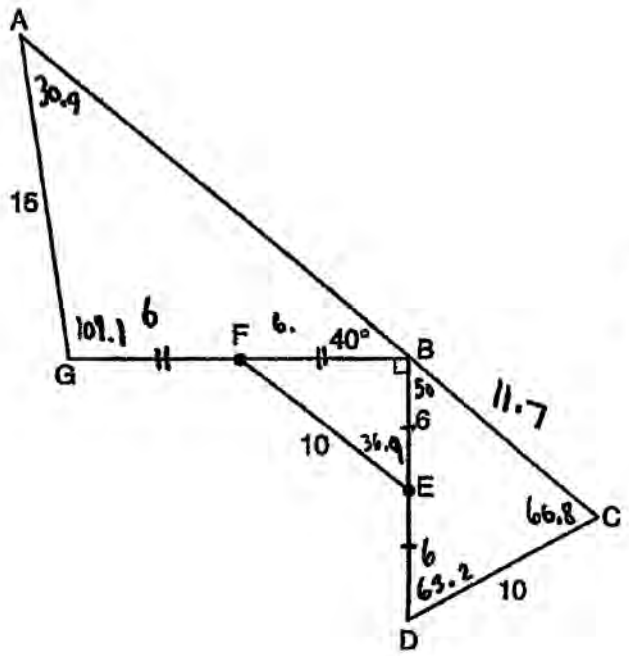
Find $m\angle A$ to the *nearest tenth*.

Find BC to the *nearest tenth*.

Score 5: The student showed appropriate work to find 11.7 and found BG to be 16.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



$\frac{15}{\sin 40}$ $\frac{12}{\sin x}$

$\frac{x}{\sin 109.1}$ $\frac{15}{\sin 46}$

Find $m\angle A$ to the *nearest tenth*.

$m\angle A = 30.9$

Find BC to the *nearest tenth*.

$BC = 11.7$

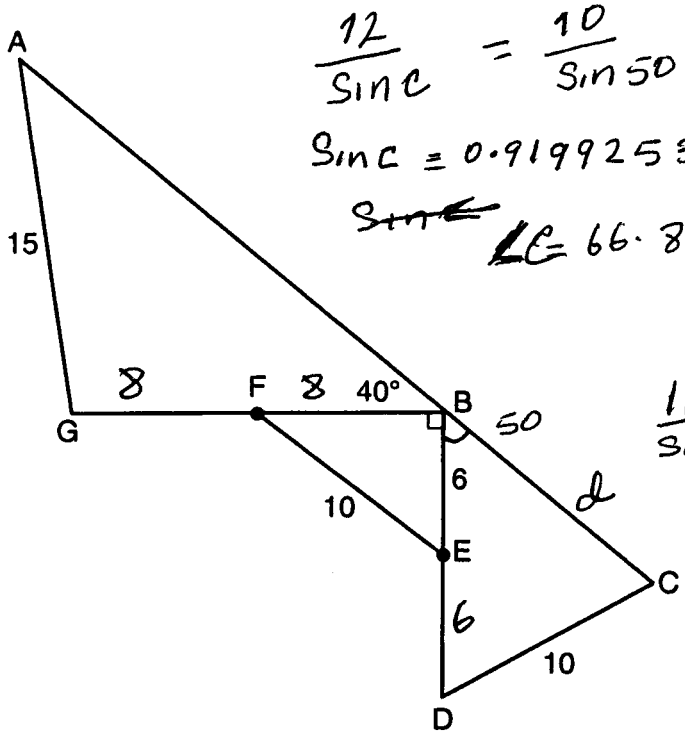
$\frac{10}{\sin 90} = \frac{6}{\sin x}$

$\frac{10}{\sin 50} = \frac{12}{\sin x}$ $\frac{x}{\sin 63.2} = \frac{10}{\sin 50}$

Score 4: The student made one conceptual error by assuming $\overline{GF}$ and $\overline{FB}$ are congruent to $\overline{BE}$.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



$\frac{12}{\sin C} = \frac{10}{\sin 50}$

$\sin C = 0.919925333317$

$\angle C = 66.817167708$

$\frac{16}{\sin A} = \frac{15}{\sin 40}$

$15 \sin A = 16 \sin 40$

$\sin A = \frac{16 \sin 40}{15}$

$\sin A = 0.6026133841$

$A \approx 37.1$

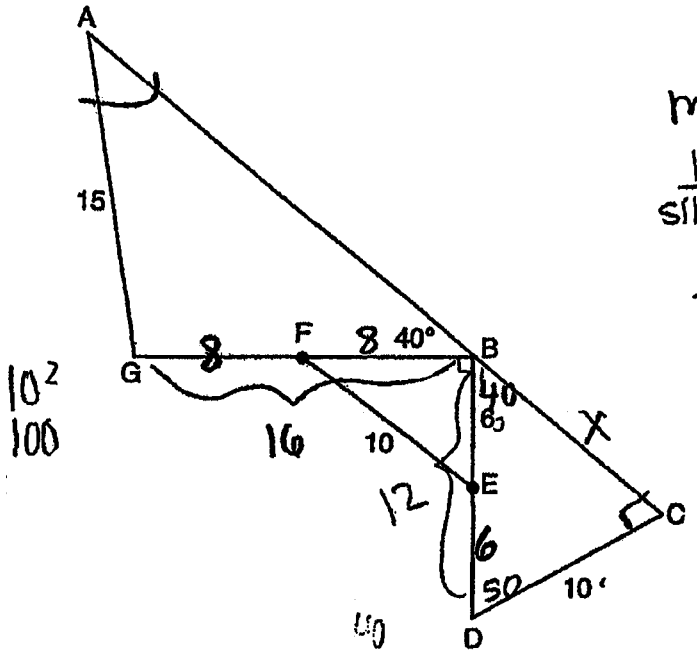
Find $m\angle A$ to the *nearest tenth*.

Find BC to the *nearest tenth*.

Score 4: The student found $\angle C$ correctly, and BG = 16 but made a computational error when evaluating sin A.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



m∠A:

$\frac{16}{\sin A} = \frac{15}{\sin 40}$

$\frac{15\sin A}{15} = \frac{16\sin 40}{15}$

Q: I, II

RS: 43.28596

θ: 43.3

180 − (40 + 90)
= 50

$a^2 = b^2 + c^2 - 2bc\cos A$

$d = 10^2 + 12^2 - 2(10)(12)\cos 50$

$d = 89.730976$

$d = 89.7$

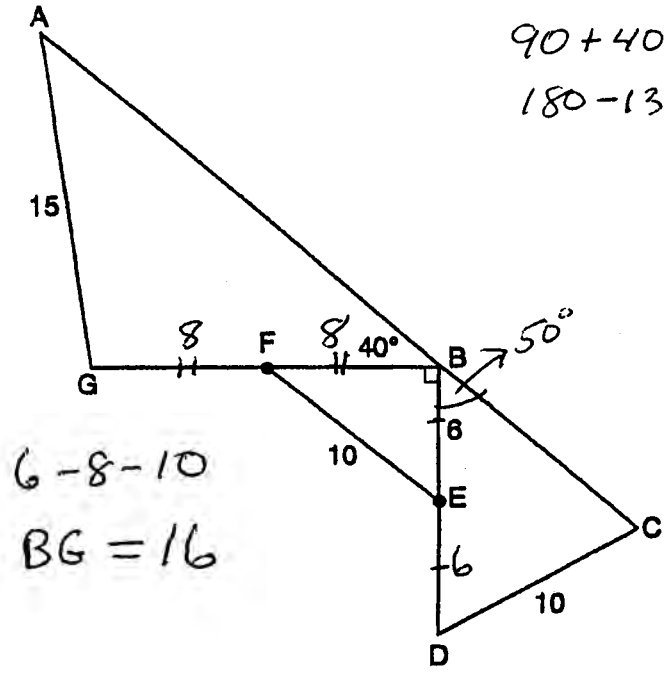
Find m∠A to the *nearest tenth*.

Find *BC* to the *nearest tenth*.

Score 3: The student correctly found ∠A and the student found *BG*.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



90 + 40 = 130
180 − 130 = 50

$\frac{\sin 50}{10} = \frac{\sin C}{12}$

$C = 66.817$

6-8-10
BG = 16

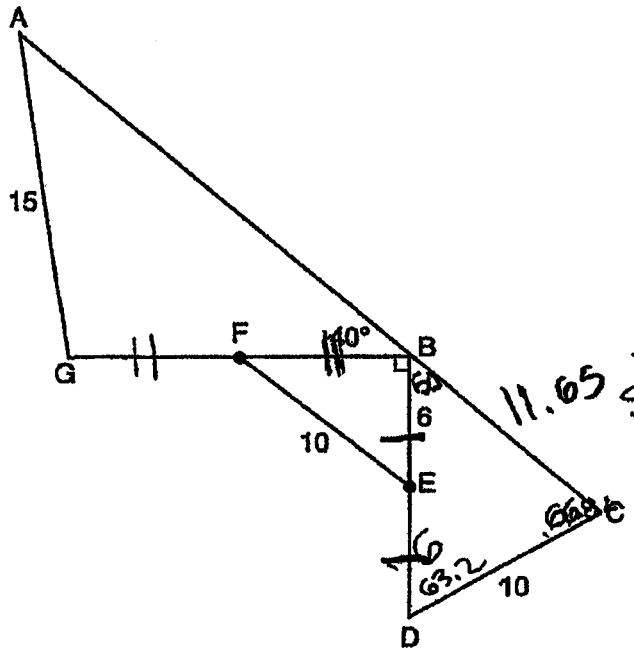
Find $m\angle A$ to the *nearest tenth*.

Find BC to the *nearest tenth*.

Score 3: The student found $m\angle C$ and BG, but showed no further work.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



$\frac{x}{\sin 63.2} = \frac{10}{\sin 50}$

$\frac{x \sin 50}{\sin 50} = \frac{10 \sin 63.2}{\sin 50}$

$\frac{10}{\sin 50} = \frac{12}{\sin \theta}$

11.65

$\frac{10 \sin \theta}{10} = \frac{12 \sin 50}{10}$

$\theta = 66.82$

Find $m\angle A$ to the *nearest tenth*.

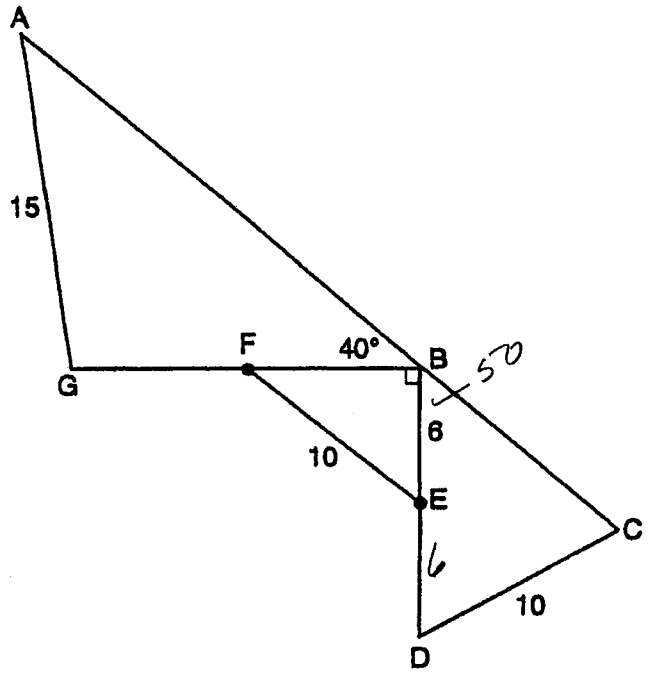
$BC = 11.65$

Find BC to the *nearest tenth*.

Score 3: The student showed appropriate work to find BC, but did not round properly.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



$$\frac{12}{\sin C} = \frac{10}{\sin 50}$$

$$10 \sin C = 12 \sin 50$$

$$C = \sin^{-1}\left(\frac{12 \sin 50}{10}\right)$$

$$C = 66.817167^{\circ}$$

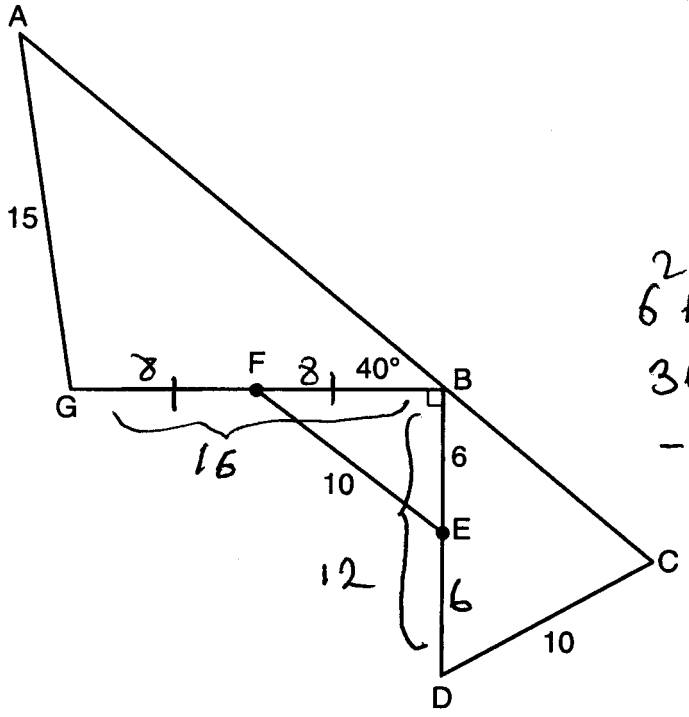
Find $m\angle A$ to the *nearest tenth*.

Find BC to the *nearest tenth*.

Score 2: The student found $m\angle C$, but showed no further work.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



$6^2 + b^2 = 10^2$
$36 + b^2 = 100$
$-36 \quad -36$
$\sqrt{b^2} = \sqrt{64}$
$b = 8$

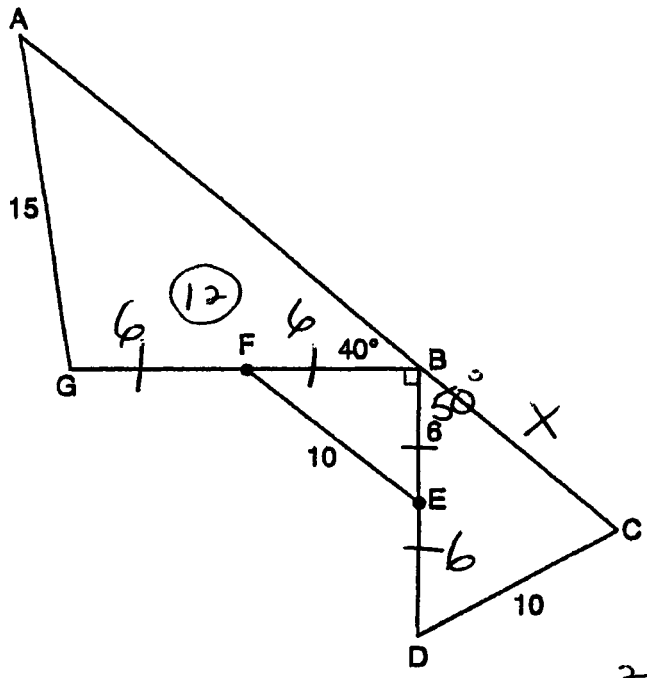
Find $m\angle A$ to the *nearest tenth*.

Find BC to the *nearest tenth*.

Score 1: The student found $\overline{BG}$, but showed no further work.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



$x^2 = 12^2 + 10^2 - 2(12)(10)\cos 50$

$x^2 = 144 + 100 - 154.269$

$x^2 = 89.731$

$x = 9.47$

$x = 9.5$

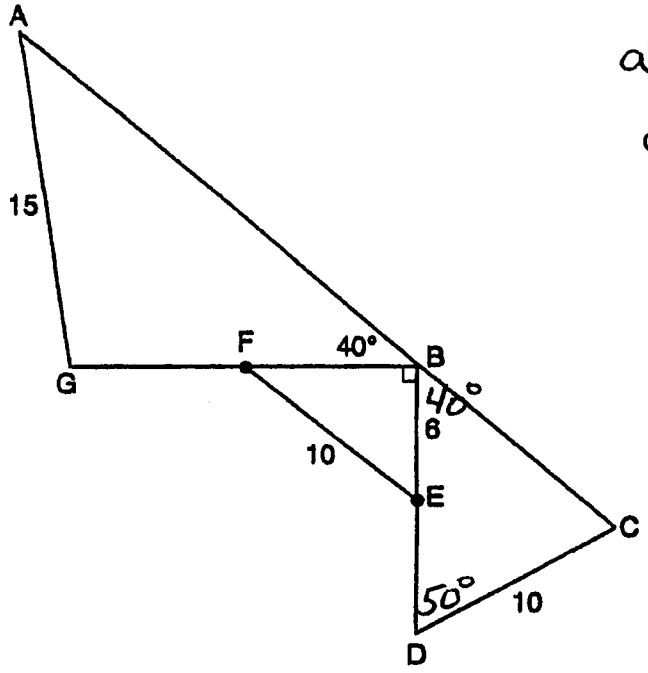
Find $m\angle A$ to the *nearest tenth*.

Find BC to the *nearest tenth*.

Score 0: The student wrote a completely incorrect response.

Question 39

39 Given: $DC = 10$, $AG = 15$, $BE = 6$, $FE = 10$,
$m\angle ABG = 40$, $m\angle GBD = 90$, $m\angle C < 90$,
$\overline{BE} \cong \overline{ED}$, and $\overline{GF} \cong \overline{FB}$



$a^2 = b^2 + c^2 - 2bc\cos A$

$a = 10^2 + 12^2 - 2(10)(12)\cos 50$

$a = 89.730976$

$a = 89.7$

Find $m\angle A$ to the *nearest tenth*. $= 89.7$

Find BC to the *nearest tenth*.

Score 0: The student wrote a completely incorrect response.