

The University of the State of New York
REGENTS HIGH SCHOOL EXAMINATION

INTEGRATED ALGEBRA

Wednesday, June 12, 2013 — 1:15 p.m.

SAMPLE RESPONSE SET

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Practice Papers—Question 31

31 Solve the inequality $-5(x - 7) < 15$ algebraically for x .

$$\begin{array}{r} -5x + 35 < 15 \\ \quad -35 \quad -35 \\ \hline -5x < -20 \\ \underline{-5} \quad \underline{-5} \\ x > 4 \end{array}$$

Score: 2

The student has a complete and correct response.

Practice Papers—Question 31

31 Solve the inequality $-5(x - 7) < 15$ algebraically for x .

$$\begin{array}{r} -5x + 35 < 15 \\ -35 \quad -35 \\ \hline \end{array}$$

$$\begin{array}{r} -5x < -20 \\ -5 \quad -5 \end{array}$$

$$\boxed{x < 4}$$

Score: 1

The student made one conceptual error by not reversing the inequality symbol.

Practice Papers—Question 31

31 Solve the inequality $-5(x - 7) < 15$ algebraically for x .

$$\begin{array}{r} -5x + 35 = 15 \\ \quad -35 \quad -35 \\ \hline -5x = -20 \\ \quad -5 \quad -5 \\ \hline x = 4 \end{array}$$

Score: 1

The student made a conceptual error by using an equal sign instead of an inequality symbol.

Practice Papers—Question 31

31 Solve the inequality $-5(x - 7) < 15$ algebraically for x .

$$-5(x-7) < 15$$

$$-5(6x) < 15$$

$$\frac{-30x}{-30} < \frac{15}{-30}$$

$$x < -\frac{1}{2}$$

Score: 0

The student made two conceptual errors, the first by combining unlike terms, and the second by not reversing the inequality symbol.

Practice Papers—Question 31

31 Solve the inequality $-5(x - 7) < 15$ algebraically for x .

$$-5(x-7) < 15$$

$$\begin{array}{r} -5x + 75 < 15 \\ -35 \quad -35 \end{array}$$

$$\begin{array}{r} -5x < -20 \\ \hline -5 \quad -5 \end{array}$$

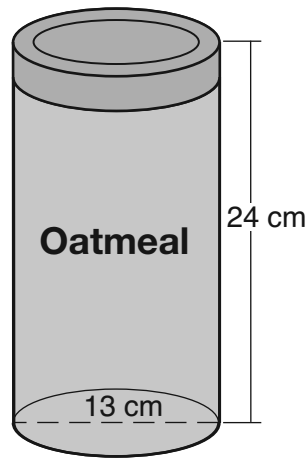
$$x < 5$$

Score: 0

The student made a computational error: $\frac{-20}{-5} = 5$, and a conceptual error by not reversing the inequality symbol.

Practice Papers—Question 32

32 Oatmeal is packaged in a cylindrical container, as shown in the diagram below.



The diameter of the container is 13 centimeters and its height is 24 centimeters. Determine, in terms of π , the volume of the cylinder, in cubic centimeters.

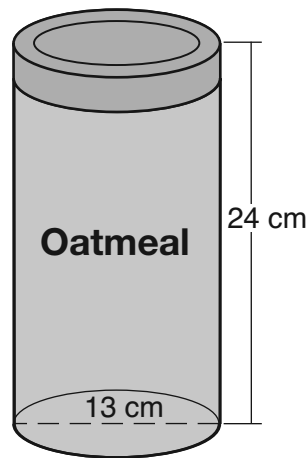
$$V = \pi 6.5^2 (24)$$
$$V = \pi (42.25)(24)$$
$$V = 1014 \pi$$

Score: 2

The student has a complete and correct response showing a correct substitution into the volume formula.

Practice Papers—Question 32

32 Oatmeal is packaged in a cylindrical container, as shown in the diagram below.



The diameter of the container is 13 centimeters and its height is 24 centimeters. Determine, in terms of π , the volume of the cylinder, in cubic centimeters.

$$V = \pi r^2 h$$

$$\pi \left(\frac{13}{2}\right)^2 24$$

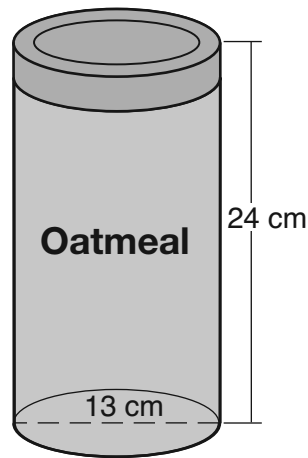
$$1014\pi$$

Score: 2

The student has a complete and correct response showing a correct substitution into the volume formula.

Practice Papers—Question 32

32 Oatmeal is packaged in a cylindrical container, as shown in the diagram below.



The diameter of the container is 13 centimeters and its height is 24 centimeters. Determine, in terms of π , the volume of the cylinder, in cubic centimeters.

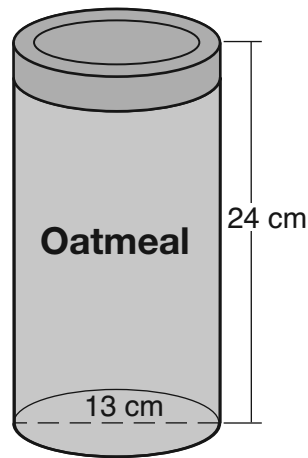
$$\begin{aligned}V &= \pi r^2 h \\V &= \pi (6.5)^2 (24) \\V &= \pi (13) (24) \\V &= 312\pi\end{aligned}$$

Score: 1

The student made a conceptual error: $(6.5)^2 = 13$, but found an appropriate answer.

Practice Papers—Question 32

32 Oatmeal is packaged in a cylindrical container, as shown in the diagram below.



The diameter of the container is 13 centimeters and its height is 24 centimeters. Determine, in terms of π , the volume of the cylinder, in cubic centimeters.

$$\begin{aligned} 13(24) &= 360 \\ \frac{312}{360} &= \frac{360}{360} \\ 360 &= 360 \\ \boxed{1.15 = X} \end{aligned}$$

Score: 0

The student showed completely incorrect work.

Practice Papers—Question 33

33 The distance from Earth to Mars is 136,000,000 miles. A spaceship travels at 31,000 miles per hour. Determine, to the *nearest day*, how long it will take the spaceship to reach Mars.

$$\begin{array}{r} 31,000 \\ \times 24 \\ \hline 124000 \\ 620000 \\ \hline 744000 \text{ per day} \end{array}$$

$$\begin{array}{r} 182.79569 \\ 744000 \overline{)136,000,000} \\ \hline 182.79569 \end{array}$$

183 days

Score: 2

The student found the number of miles traveled per day, then correctly found the number of days.

Practice Papers—Question 33

- 33 The distance from Earth to Mars is 136,000,000 miles. A spaceship travels at 31,000 miles per hour. Determine, to the *nearest day*, how long it will take the spaceship to reach Mars.

$$\begin{aligned} X &= \text{hrs to travel} \\ &\quad \text{to mars from Earth} \\ \frac{1 \text{ hr}}{31,000 \text{ mi}} &= \frac{X \text{ hr}}{136,000,000 \text{ mi}} \\ \frac{136,000,000}{31,000} &= \frac{31,000X}{31,000} \\ X &= \frac{4387.096774 \text{ hrs}}{24} \\ &= 182.79 \text{ days} \end{aligned}$$

It would take 183 days to reach
mars

Score: 2

The student solved the proportion to find the number of hours and then converted the time correctly to days.

Practice Papers—Question 33

- 33 The distance from Earth to Mars is 136,000,000 miles. A spaceship travels at 31,000 miles per hour. Determine, to the *nearest day*, how long it will take the spaceship to reach Mars.

$$\begin{aligned} 136,000,000 &= 31,000 t \\ 4387.1 &= t \\ &\times 24 \\ \hline &105290 \text{ days.} \end{aligned}$$

Score: 1

The student showed correct work to find 4387.1 hours and then made a conceptual error in multiplying by 24 instead of dividing.

Practice Papers—Question 33

- 33 The distance from Earth to Mars is 136,000,000 miles. A spaceship travels at 31,000 miles per hour. Determine, to the *nearest day*, how long it will take the spaceship to reach Mars.

Let $x =$ hours to take

$$\frac{1}{31000} = \frac{x = 4387}{136000000}$$

$$\frac{136000000}{31000} = \frac{31000x}{31000}$$

$$4387$$

$y =$ days to take

$$\frac{1}{24} = \frac{y}{4387}$$

$$\frac{y \cdot 24}{24} = \frac{4387}{24}$$

$$y = 182 \text{ days.}$$

Score: 1

The student made one rounding error: $4387 \div 24 = 182.79$, which should round off to 183.

Practice Papers—Question 33

33 The distance from Earth to Mars is 136,000,000 miles. A spaceship travels at 31,000 miles per hour. Determine, to the nearest day, how long it will take the spaceship to reach Mars.

$$\begin{array}{c} 136,000,000 \\ \leftarrow \text{Earth to Mars} \rightarrow \\ 31000 / 300000000 \\ \text{2 weeks} \\ \text{and } 2\frac{1}{2} \\ \text{days} \end{array}$$

$$\begin{array}{c} 31,000 \text{ miles} \\ \text{per hour} \\ 31,000 \times 34 = \\ 1,054,000 \end{array}$$

Score: 0

The student showed completely incorrect work.

Practice Papers—Question 34

34 The menu for the high school cafeteria is shown below.

| Main Course | Vegetable | Dessert | Beverage |
|-----------------|-------------|---------------|---------------|
| veggie burger | corn | gelatin | milk |
| pizza | green beans | fruit salad | juice |
| tuna sandwich | carrots | yogurt | bottled water |
| frankfurter | | cookie | |
| chicken tenders | | ice cream cup | |

Determine the number of possible meals consisting of a main course, a vegetable, a dessert, and a beverage that can be selected from the menu.

$$5 \times 3 \times 5 \times 3 = 225 \text{ meals}$$

Determine how many of these meals will include chicken tenders.

$$1 \times 3 \times 5 \times 3 = 45 \text{ meals}$$

If a student chooses pizza, corn or carrots, a dessert, and a beverage from the menu, determine the number of possible meals that can be selected.

$$1 \times 2 \times 5 \times 3 = 30 \text{ meals}$$

Score: 3

The student showed correct work to find 225, 45, and 30.

Practice Papers—Question 34

34 The menu for the high school cafeteria is shown below.

| Main Course | Vegetable | Dessert | Beverage |
|-----------------|-------------|---------------|---------------|
| veggie burger | corn | gelatin | milk |
| pizza | green beans | fruit salad | juice |
| tuna sandwich | carrots | yogurt | bottled water |
| frankfurter | | cookie | |
| chicken tenders | | ice cream cup | |

Determine the number of possible meals consisting of a main course, a vegetable, a dessert, and a beverage that can be selected from the menu.

$$5 \cdot 3 \cdot 5 \cdot 3 = 225$$

Determine how many of these meals will include chicken tenders.

$$1 \cdot 3 \cdot 5 \cdot 3 = 45$$

If a student chooses pizza, corn or carrots, a dessert, and a beverage from the menu, determine the number of possible meals that can be selected.

$$1 \cdot 2 \cdot 5 \cdot 3 = 30$$

Score: 3

The student showed correct work to find 225, 45, and 30.

Practice Papers—Question 34

34 The menu for the high school cafeteria is shown below.

| Main Course | Vegetable | Dessert | Beverage |
|-----------------|-------------|---------------|---------------|
| veggie burger | corn | gelatin | milk |
| pizza | green beans | fruit salad | juice |
| tuna sandwich | carrots | yogurt | bottled water |
| frankfurter | | cookie | |
| chicken tenders | | ice cream cup | |

Determine the number of possible meals consisting of a main course, a vegetable, a dessert, and a beverage that can be selected from the menu.

$$5 \cdot 3 \cdot 5 \cdot 3 = 225$$

Determine how many of these meals will include chicken tenders.

$$225 /$$

If a student chooses pizza, corn or carrots, a dessert, and a beverage from the menu, determine the number of possible meals that can be selected.

$$30$$

$$1 \cdot 2 \cdot 5 \cdot 3 = 30$$

Score: 2

The student showed appropriate work for the 225 and 30, but showed no further correct work.

Practice Papers—Question 34

34 The menu for the high school cafeteria is shown below.

| Main Course | Vegetable | Dessert | Beverage |
|-----------------|-------------|---------------|---------------|
| veggie burger | corn | gelatin | milk |
| pizza | green beans | fruit salad | juice |
| tuna sandwich | carrots | yogurt | bottled water |
| frankfurter | | cookie | |
| chicken tenders | | ice cream cup | |

Determine the number of possible meals consisting of a main course, a vegetable, a dessert, and a beverage that can be selected from the menu.

$$5 \times 3 \times 5 \times 3 = 225$$

Determine how many of these meals will include chicken tenders.

$$45$$

If a student chooses pizza, corn or carrots, a dessert, and a beverage from the menu, determine the number of possible meals that can be selected.

$$30$$

Score: 1

The student showed work for 225, but showed no work for 45 and 30.

Practice Papers—Question 34

34 The menu for the high school cafeteria is shown below.

| Main Course | Vegetable | Dessert | Beverage |
|-----------------|-------------|---------------|---------------|
| veggie burger | corn | gelatin | milk |
| pizza | green beans | fruit salad | juice |
| tuna sandwich | carrots | yogurt | bottled water |
| frankfurter | | cookie | |
| chicken tenders | | ice cream cup | |

Determine the number of possible meals consisting of a main course, a vegetable, a dessert, and a beverage that can be selected from the menu.

$$\begin{array}{cccc} \text{main} & \text{veggie} & \text{Dessert} & \text{Beverage} \\ 5 & \times 4 & \times 5 & \times 4 \rightarrow 400 \end{array}$$

Determine how many of these meals will include chicken tenders.

$$\begin{array}{cccc} \text{main} & \text{veggie} & \text{Dessert} & \text{Beverage} \\ 1 & \times 4 & \times 5 & \times 3 \rightarrow 60 \end{array}$$

If a student chooses pizza, corn or carrots, a dessert, and a beverage from the menu, determine the number of possible meals that can be selected.

$$\begin{array}{cccc} \text{main} & \text{veggie} & \text{Dessert} & \text{Beverage} \\ 1 & \times 2 & \times 5 & \times 4 \end{array}$$

$$\text{Answer} = 40 \text{ possibilities}$$

Score: 1

The student counted the number of vegetables and the number of beverages incorrectly, but multiplied the number of outcomes after these errors.

Practice Papers—Question 34

34 The menu for the high school cafeteria is shown below.

| Main Course | Vegetable | Dessert | Beverage |
|-----------------|-------------|---------------|---------------|
| veggie burger | corn | gelatin | milk |
| pizza | green beans | fruit salad | juice |
| tuna sandwich | carrots | yogurt | bottled water |
| frankfurter | | cookie | |
| chicken tenders | | ice cream cup | |

Determine the number of possible meals consisting of a main course, a vegetable, a dessert, and a beverage that can be selected from the menu.

$$5 \times 3 \cdot 5 \times 3 \quad 5 \times 9 \times 3 \times 2 \times 1 = 120$$

120 possible meals

Determine how many of these meals will include chicken tenders.

$$5 = \frac{120}{100} = 24$$

12

24 meals

If a student chooses pizza, corn or carrots, a dessert, and a beverage from the menu, determine the number of possible meals that can be selected.

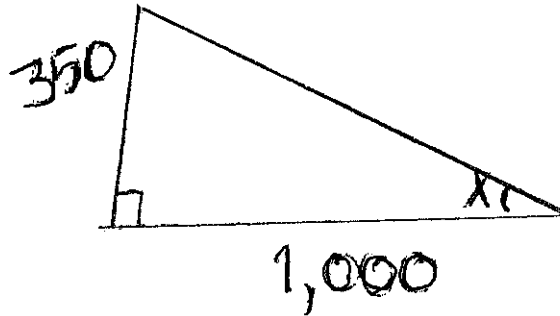
$$11 \times 4 = 44 = 3 \times 14 \text{ meals}$$

Score: 0

The student showed completely incorrect work.

Practice Papers—Question 35

- 35 A man standing on level ground is 1000 feet away from the base of a 350-foot-tall building. Find, to the *nearest degree*, the measure of the angle of elevation to the top of the building from the point on the ground where the man is standing.



$$\tan x = \frac{350}{1000}$$

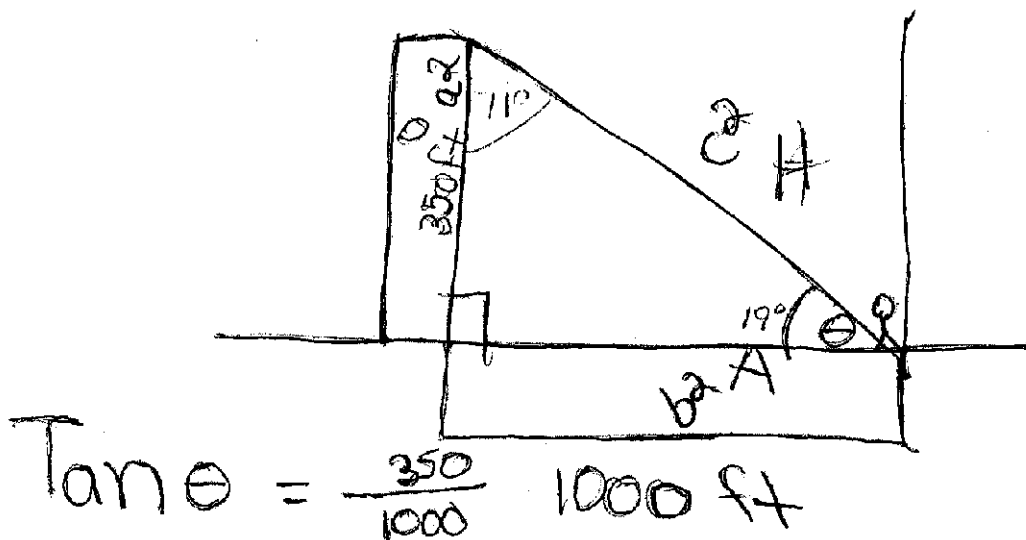
$$x = 19^\circ$$

Score: 3

The student has a complete and correct response. (The degree symbol is not required.)

Practice Papers—Question 35

35 A man standing on level ground is 1000 feet away from the base of a 350-foot-tall building. Find, to the nearest degree, the measure of the angle of elevation to the top of the building from the point on the ground where the man is standing.



$$\tan \theta = \frac{350}{1000} \quad 1000 \text{ ft}$$

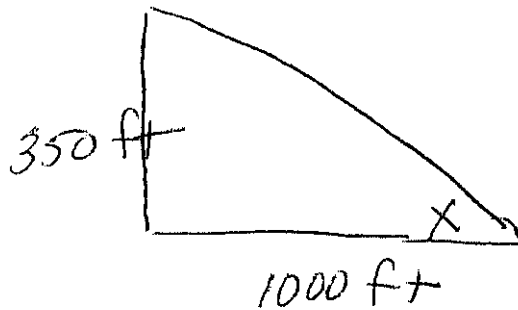
$$\theta = 19^\circ$$

Score: 3

The student has a complete and correct response.

Practice Papers—Question 35

- 35 A man standing on level ground is 1000 feet away from the base of a 350-foot-tall building. Find, to the *nearest degree*, the measure of the angle of elevation to the top of the building from the point on the ground where the man is standing.



$$\tan x = \frac{350}{1000}$$

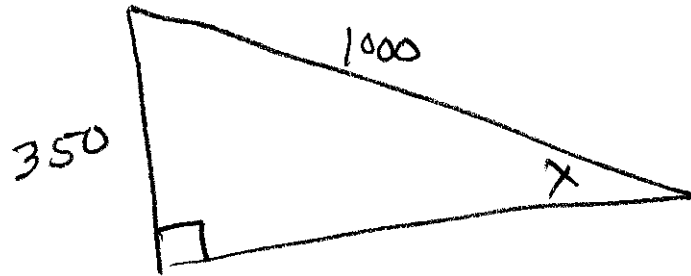
$$x = 19.290^\circ$$

Score: 2

The student made one rounding error, but stated an appropriate solution.

Practice Papers—Question 35

- 35 A man standing on level ground is 1000 feet away from the base of a 350-foot-tall building. Find, to the *nearest degree*, the measure of the angle of elevation to the top of the building from the point on the ground where the man is standing.



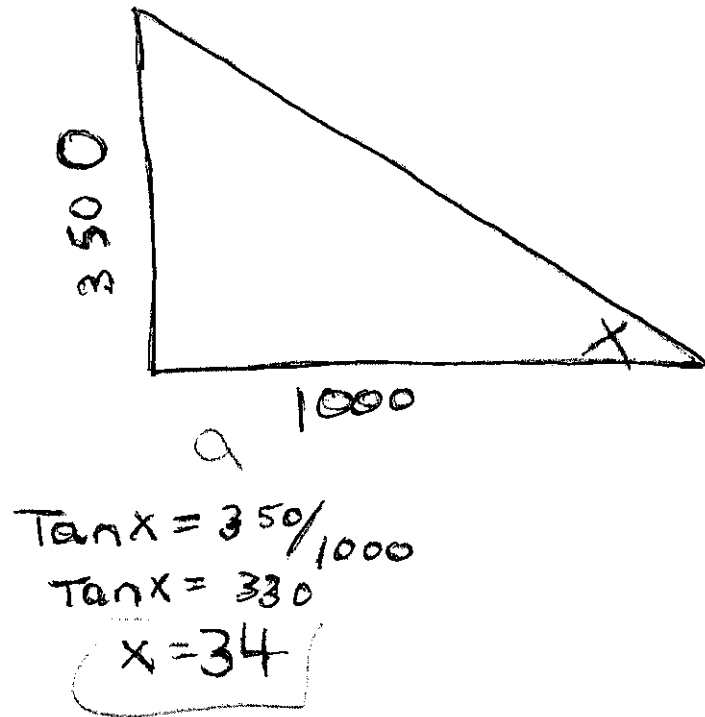
$$\sin x = \frac{350}{1000}$$
$$x = 20^\circ$$

Score: 1

The student found a correct angle from an incorrect diagram.

Practice Papers—Question 35

- 35 A man standing on level ground is 1000 feet away from the base of a 350-foot-tall building. Find, to the *nearest degree*, the measure of the angle of elevation to the top of the building from the point on the ground where the man is standing.



Score: 1

The student wrote a correct equation, but showed no further correct work.

Practice Papers—Question 35

- 35 A man standing on level ground is 1000 feet away from the base of a 350-foot-tall building. Find, to the *nearest degree*, the measure of the angle of elevation to the top of the building from the point on the ground where the man is standing.



$$\tan x = \frac{1000}{350}$$

$$\tan^{-1}(1000/350)$$

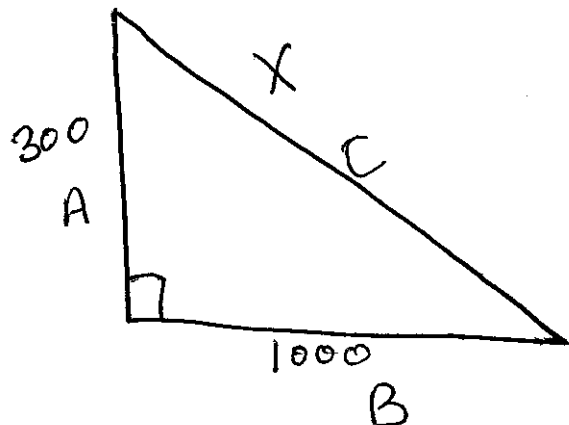
$$\underline{X = 1^\circ}$$

Score: 0

The student made one conceptual error in the diagram and found an angle using radians.

Practice Papers—Question 35

- 35 A man standing on level ground is 1000 feet away from the base of a 350-foot-tall building. Find, to the *nearest degree*, the measure of the angle of elevation to the top of the building from the point on the ground where the man is standing.



$$\begin{aligned}A^2 + b^2 &= c^2 \\350^2 + 1000^2 &= X^2 \\122500 + 1000000 &= X^2 \\1122500 &= X^2 \\X &= \sqrt{1122500} \\X &= 1059.481005\text{ft}\end{aligned}$$

Score: 0

The student showed completely irrelevant work.

Practice Papers—Question 36

36 Express $\sqrt{25} - 2\sqrt{3} + \sqrt{27} + 2\sqrt{9}$ in simplest radical form.

$$\begin{array}{cccc} \sqrt{25} & - & 2\sqrt{3} & + \sqrt{27} + 2\sqrt{9} \\ 5 & - & 2\sqrt{3} & + \sqrt{3 \cdot 9} + 2\sqrt{3 \cdot 3} \\ \textcircled{5} & - & \textcircled{2\sqrt{3}} & + \textcircled{3\sqrt{3}} + \textcircled{6} \\ & & & \textcircled{11 + 1\sqrt{3}} \end{array}$$

Score: 3

The student has a complete and correct response.

Practice Papers—Question 36

36 Express $\sqrt{25} - 2\sqrt{3} + \sqrt{27} + 2\sqrt{9}$ in simplest radical form.

$$\begin{aligned}5 - 2\sqrt{3} + \sqrt{27} + 2\sqrt{9} \\5 - 2\sqrt{3} + \sqrt{27} + 6 \\11 - 2\sqrt{3} + \sqrt{27}\end{aligned}$$

Score: 2

The student made one simplification error, but found an appropriate answer.

Practice Papers—Question 36

36 Express $\sqrt{25} - 2\sqrt{3} + \sqrt{27} + 2\sqrt{9}$ in simplest radical form.

$$5 - 2\sqrt{3} + \sqrt{9}\sqrt{3} + 6$$

$$11 - 2\sqrt{3} + 3\sqrt{3}$$

$$11 + 2\sqrt{3}$$

Score: 2

The student made a computational error: $-2\sqrt{3} + 3\sqrt{3} = 2\sqrt{3}$, but found an appropriate answer.

Practice Papers—Question 36

36 Express $\sqrt{25} - 2\sqrt{3} + \sqrt{27} + 2\sqrt{9}$ in simplest radical form.

$$\begin{aligned} &\sqrt{35} - 2\sqrt{3} + \sqrt{27} + 2\sqrt{9} \\ &5 - 2\sqrt{3} + \sqrt{9}\sqrt{3} + 2 \cdot 3 \\ &5 - 2\sqrt{3} + 3\sqrt{3} + 6 \\ &3\sqrt{3} + 9\sqrt{3} \\ &12\sqrt{3} \end{aligned}$$

Score: 1

The student made a conceptual error by combining unlike terms.

Practice Papers—Question 36

36 Express $\sqrt{25} - 2\sqrt{3} + \sqrt{27} + 2\sqrt{9}$ in simplest radical form.

$$\begin{array}{c} \sqrt{25} = 2\sqrt{3} + \sqrt{27} + 2\sqrt{9} \\ \downarrow \qquad \qquad \downarrow \\ 5 \quad - \quad 3.5 \quad + \quad 5.2 \quad + \quad 6 \\ \swarrow \quad \searrow \qquad \qquad \swarrow \quad \searrow \\ 1.5 \qquad \qquad \qquad + \qquad \qquad 11.2 \\ \swarrow \quad \searrow \\ \boxed{12.7} \end{array}$$

Score: 0

The student expressed the answer as a decimal.

Practice Papers—Question 36

36 Express $\sqrt{25} - 2\sqrt{3} + \sqrt{27} + 2\sqrt{9}$ in simplest radical form.

1, 4, 9, 16, 25, 36, ⁴⁹ 49, 81, 100

$$\begin{array}{l} \sqrt{25} \\ 5 - 2\sqrt{3} + \frac{\sqrt{27}}{\sqrt{9}} \\ \phantom{5 - 2\sqrt{3} +} 3\sqrt{3} \end{array}$$

$$\begin{array}{l} 5 - 2\sqrt{3} + 3\sqrt{3} + 2\sqrt{9} \\ 3\sqrt{3} + 3\sqrt{3} + 2\sqrt{9} \\ 3\sqrt{3} + 3\sqrt{3} + 2\sqrt{3} \\ \boxed{8\sqrt{3}} \end{array}$$

Score: 0

The student made a conceptual error: $5 - 2\sqrt{3} = 3\sqrt{3}$, and then made another conceptual error: $2\sqrt{9} = 2\sqrt{3}$.

Practice Papers—Question 37

37 Solve algebraically: $\frac{2}{3x} + \frac{4}{x} = \frac{7}{x+1}$

[Only an algebraic solution can receive full credit.]

$$\frac{2}{3x} + \frac{4}{x} = \frac{7}{x+1}$$

$$\frac{2}{3x} + \frac{12}{3x} = \frac{7}{x+1}$$

$$\frac{14}{3x} = \frac{7}{x+1}$$

$$21x = 14x + 14$$

$$7x = 14$$

Ans $x = 2$

Check

$$\frac{2}{6} + \frac{4}{2} = \frac{7}{3}$$

$$\frac{2}{6} + \frac{12}{6} = \frac{14}{6} = \frac{7}{3}$$

$$\frac{7}{3} = \frac{7}{3}$$

check

Score: 4

The student has a complete and correct response.

Practice Papers—Question 37

37 Solve algebraically: $\frac{2}{3x} + \frac{4}{x} = \frac{7}{x+1}$

[Only an algebraic solution can receive full credit.]

$$\frac{2}{3x} + \frac{12}{3x} = \frac{21}{3x+3}$$

$$\frac{14}{3x} = \frac{21}{3x+3}$$

$$\begin{array}{r} 42x + 42 = 63x \\ \quad \quad \quad -42x \\ \hline 42 = 21x \\ \hline 21 \end{array}$$

$$x = 2$$

Score: 4

The student has a complete and correct response.

Practice Papers—Question 37

37 Solve algebraically: $\frac{2}{3x} + \frac{4}{x} = \frac{7}{x+1}$

[Only an algebraic solution can receive full credit.]

$$3 \left(\frac{2}{3x} + \frac{4}{x} \right) = \left(\frac{7}{x+1} \right) 3$$

$$\frac{6}{x} + \frac{12}{x} = \frac{21}{x+1}$$

$$\frac{18}{x} = \frac{21}{x+1}$$

$$18x + 18 = 21x$$

$$18 = 3x$$

$$x = 6$$

Score: 3

The student made one computational error: $3 \left(\frac{2}{3x} \right) = \frac{6}{x}$.

Practice Papers—Question 37

37 Solve algebraically: $\frac{2}{3x} + \frac{4}{x} = \frac{7}{x+1}$

[Only an algebraic solution can receive full credit.]

$$\frac{2}{3x} + \frac{4}{x} = \frac{7}{x+1}$$

$$\frac{2}{3x} + \frac{12}{3x} = \frac{14}{3x}$$

$$\frac{14}{3x} = \frac{7}{x+1} = \frac{14x+1}{-14} = \frac{21x}{-14}$$

$$\frac{7x}{7} = \frac{1}{7}$$

$$x = \frac{1}{7}$$

Score: 2

The student made a conceptual error in multiplying: $14(x+1) = 14x+1$.

Practice Papers—Question 37

37 Solve algebraically: $\frac{2}{3x} + \frac{4}{x} = \frac{7}{x+1}$

[Only an algebraic solution can receive full credit.]

$$\frac{2}{3x} + \frac{7}{3x} = \frac{7}{x+1}$$

$$\frac{10}{3x} = \frac{7}{x+1}$$
$$10x + 10 = 21x$$
$$10 = 11x$$
$$\frac{10}{11} = x$$

Score: 2

The student made two computational errors: $3 \cdot 4 = 7$ and $\frac{2}{3x} + \frac{7}{3x} = \frac{10}{3x}$, but wrote an appropriate solution.

Practice Papers—Question 37

37 Solve algebraically: $\frac{2}{3x} + \frac{4}{x} = \frac{7}{x+1}$

[Only an algebraic solution can receive full credit.]

$$\frac{2}{3x} + \frac{7}{3x} = \frac{7}{x+1}$$

$$\frac{9}{3x} = \frac{7}{x+1}$$

$$9x+1 = 21x$$

$$1 = 12x$$

$$\frac{1}{12} = x$$

Score: 1

The student made a computational error: $3 \cdot 4 = 7$ and a conceptual error: $9(x+1) = 9x+1$, but found an appropriate solution.

Practice Papers—Question 37

37 Solve algebraically: $\frac{2}{3x} + \frac{4}{x} = \frac{7}{x+1}$

[Only an algebraic solution can receive full credit.]

$$\frac{2}{3x} + \frac{4}{x} = \frac{7}{x+1}$$

$$\frac{6}{4x} = \frac{7}{x+1}$$

$$6(x+1) = 28x$$

$$\begin{array}{r} 6x+1 = 28x \\ -6x \quad -6x \end{array}$$

$$\begin{array}{r} 1 = \frac{22x}{22} \\ x = \frac{1}{22} \end{array}$$

Score: 0

The student made two conceptual errors: $\frac{2}{3x} + \frac{4}{x} = \frac{6}{4x}$ and $6(x+1) = 6x+1$.

Practice Papers—Question 37

37 Solve algebraically: $\frac{2}{3x} + \frac{4}{x} = \frac{7}{x+1}$

[Only an algebraic solution can receive full credit.]

$$\frac{x}{4} \cdot \frac{2}{3x} + \frac{4}{x} \cdot \frac{3x}{2}$$

$$\frac{8}{4x} + \frac{8}{4x} = \frac{16}{4x} = \frac{7}{x+1}$$

$$\frac{4}{x} = \frac{7}{x+1}$$

$$\boxed{= \frac{32x}{x+16}}$$

Score: 0

The student showed completely incorrect work.

Practice Papers—Question 38

38 A jar contains five red marbles and three green marbles. A marble is drawn at random and not replaced. A second marble is then drawn from the jar.

Find the probability that the first marble is red and the second marble is green.

$$(5/8 \cdot 3/7) = \boxed{15/56}$$

Find the probability that both marbles are red.

$$5/8 \cdot 4/7 = \boxed{5/14}$$

Find the probability that both marbles are the same color.

$$\begin{array}{l} \text{Red} = 5/14 \\ \text{Green} = 3/28 \end{array} = \boxed{13/28}$$

$$3/8 \cdot 2/7 =$$

Score: 4

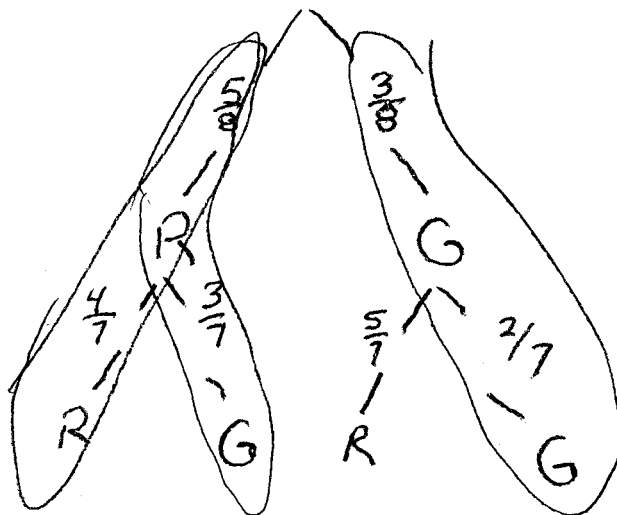
The student has a complete and correct response.

Practice Papers—Question 38

38 A jar contains five red marbles and three green marbles. A marble is drawn at random and not replaced. A second marble is then drawn from the jar.

Find the probability that the first marble is red and the second marble is green.

$$\frac{15}{56}$$



Find the probability that both marbles are red.

$$\frac{20}{56}$$

Find the probability that both marbles are the same color.

$$\frac{26}{56}$$

Score: 4

The student showed an appropriate tree diagram and found correct solutions.

Practice Papers—Question 38

38 A jar contains five red marbles and three green marbles. A marble is drawn at random and not replaced. A second marble is then drawn from the jar.

Find the probability that the first marble is red and the second marble is green.

$$\frac{5}{8} \cdot \frac{3}{7} = \frac{15}{56}$$

Find the probability that both marbles are red.

$$\frac{5}{8} \cdot \frac{4}{7} = \frac{20}{56}$$

Find the probability that both marbles are the same color.

$$\frac{4}{8} \cdot \frac{3}{7} = \frac{12}{56} + \frac{20}{56} = \frac{32}{56}$$

Score: 3

The student made one computational error in the last part using 4 green marbles instead of 3, but found appropriate answers.

Practice Papers—Question 38

38 A jar contains five red marbles and three green marbles. A marble is drawn at random and not replaced. A second marble is then drawn from the jar.

Find the probability that the first marble is red and the second marble is green.



$$P(\text{red}) = \frac{5}{8}$$

$$\frac{5}{8} \cdot \frac{3}{7} = \frac{15}{56}$$

$$P(\text{green}) = \frac{3}{7}$$

$$P(\text{red then green}) = \frac{15}{56}$$

Find the probability that both marbles are red.

$$P(\text{red}) = \frac{5}{8}$$

$$\frac{5}{8} \cdot \frac{4}{7} = \frac{20}{56} = \frac{5}{14}$$

$$P(\text{2nd red}) = \frac{4}{7}$$

$$P(\text{red then red}) = \frac{5}{14}$$

Find the probability that both marbles are the same color.

$$P(\text{red then red}) = \frac{5}{14}$$

$$P(\text{green then green}) = \frac{3}{8} \cdot \frac{2}{7}$$

$$P(\text{green then green}) = \frac{3}{28}$$

$$P(\text{2 of same color}) = \frac{5}{14} + \frac{3}{28}$$

$$P(\text{2 of same color}) = \frac{15}{28}$$

Score: 2

The student made a conceptual error in the last part by multiplying the probabilities instead of adding them.

Practice Papers—Question 38

38 A jar contains five red marbles and three green marbles. A marble is drawn at random and not replaced. A second marble is then drawn from the jar.

Find the probability that the first marble is red and the second marble is green.

$$\frac{5}{8} \cdot \frac{3}{7} = \boxed{\frac{15}{56}}$$

Find the probability that both marbles are red.

$$\frac{5}{8} \cdot \frac{4}{7} = \boxed{\frac{20}{56}}$$

Find the probability that both marbles are the same color.

$$\frac{15}{56} + \frac{20}{56} = \boxed{\frac{35}{56}}$$

Score: 2

The student showed correct work to find $\frac{15}{56}$ and $\frac{20}{56}$, but showed no further correct work.

Practice Papers—Question 38

38 A jar contains five red marbles and three green marbles. A marble is drawn at random and not replaced. A second marble is then drawn from the jar.

Find the probability that the first marble is red and the second marble is green.

$$\frac{5}{8} \cdot \frac{3}{8} = \frac{15}{64}$$

Find the probability that both marbles are red.

$$\frac{5}{8} \cdot \frac{5}{8} = \frac{10}{64}$$

Find the probability that both marbles are the same color.

$$\begin{array}{c} \text{R, R} \\ \frac{10}{64} \end{array} + \begin{array}{c} \text{G, G} \\ \frac{3}{8} \cdot \frac{3}{8} \end{array} = \frac{19}{64}$$

Score: 1

The student made one conceptual error using replacement, and one computational error: $\frac{5}{8} \cdot \frac{5}{8} = \frac{10}{64}$.

Practice Papers—Question 38

38 A jar contains five red marbles and three green marbles. A marble is drawn at random and not replaced. A second marble is then drawn from the jar.

Find the probability that the first marble is red and the second marble is green.

$$5r, 3g$$
$$\frac{5}{8}, \frac{3}{7}$$

Find the probability that both marbles are red.

$$\frac{5}{8}, \frac{4}{7}, \frac{20}{56}, \frac{10}{28}, \left(\frac{5}{14}\right)$$

Find the probability that both marbles are the same color.

$$\frac{3}{8}$$

Score: 1

The student showed appropriate work, but only the probability of both red is calculated.

Practice Papers—Question 38

38 A jar contains five red marbles and three green marbles. A marble is drawn at random and not replaced. A second marble is then drawn from the jar.

Find the probability that the first marble is red and the second marble is green.

$$\frac{5}{8}$$

$$\frac{3}{7}$$

Find the probability that both marbles are red.

$$\frac{5}{8} \quad \frac{4}{7}$$

Find the probability that both marbles are the same color.

$$\frac{5}{8} \quad \frac{4}{7} \quad \frac{3}{8} \quad \frac{2}{7}$$

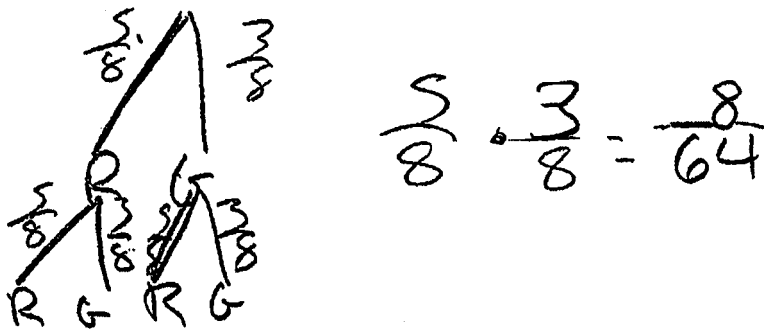
Score: 0

The student did not calculate any probabilities.

Practice Papers—Question 38

38 A jar contains five red marbles and three green marbles. A marble is drawn at random and not replaced. A second marble is then drawn from the jar.

Find the probability that the first marble is red and the second marble is green.



Find the probability that both marbles are red.

$$\frac{5}{8} \cdot \frac{4}{8} = \frac{16}{64}$$

Find the probability that both marbles are the same color.

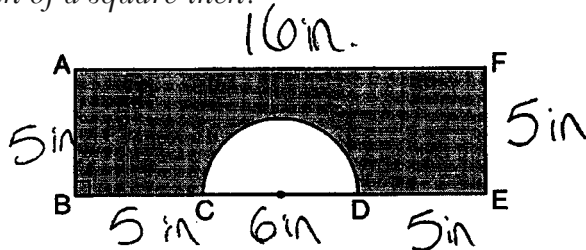
$$\begin{aligned} 2 \left(\frac{5}{8} \cdot \frac{4}{8} \right) &= \frac{16}{64} \\ \frac{16}{64} + \frac{10}{64} &= \frac{26}{64} \end{aligned}$$

Score: 0

The student made multiple conceptual and computational errors.

Practice Papers—Question 39

39 In the diagram below of rectangle $AFEB$ and a semicircle with diameter \overline{CD} , $AB = 5$ inches, $AB = BC = DE = FE$, and $CD = 6$ inches. Find the area of the shaded region, to the nearest hundredth of a square inch.



Semi-Circle:

$$A = \pi r^2$$

$$A = 9\pi \text{ in}^2$$

$$A = 28.2744 \text{ in}^2$$

$$A = 14.1372$$

rectangle:

$$A = lw$$

$$A = 16 \text{ in} \cdot 5 \text{ in}$$

$$A = 80 \text{ in}^2$$

$$\begin{array}{r} 80.0000 \\ - 14.1372 \\ \hline \end{array}$$

$$A = 65.8628 \text{ in}^2$$

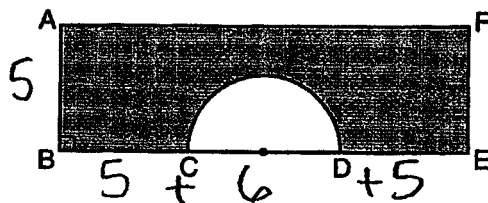
$$A = 65.86 \text{ in}^2$$

Score: 4

The student has a complete and correct response.

Practice Papers—Question 39

39 In the diagram below of rectangle $AFEB$ and a semicircle with diameter \overline{CD} , $AB = 5$ inches, $AB = BC = DE = FE$, and $CD = 6$ inches. Find the area of the shaded region, to the nearest hundredth of a square inch.



$$A(\text{shaded}) = A(\text{square}) - A(\text{semi circle})$$

whole side = 16

$$A(\text{square}) = 5 \cdot 16 = 80$$

$$A(\text{semicircle}) = \pi r^2 \div 2$$

$$A = \pi 3^2 \div 2$$

$$A = \pi 9 \div 2$$

$$A = 28.2743 \div 2$$

$$A = 14.1372$$

$$A = 14.14$$

$$A(\text{shaded}) = 80 - 14.14$$

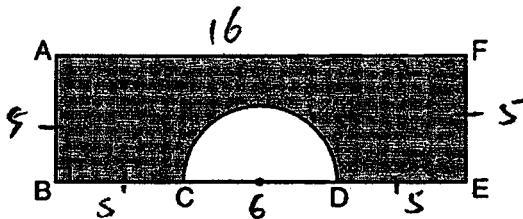
$$A = 65.86$$

Score: 4

The student has a complete and correct response.

Practice Papers—Question 39

39 In the diagram below of rectangle $AFEB$ and a semicircle with diameter \overline{CD} , $AB = 5$ inches, $AB = BC = DE = FE$, and $CD = 6$ inches. Find the area of the shaded region, to the nearest hundredth of a square inch.



$$\begin{aligned} BE = AF &= BC + CD + DE \\ &= 5 + 6 + 5 \\ &= 16 \end{aligned}$$

$$\begin{aligned} A_{\square} &= 16 \times 5 \\ &= 80 \end{aligned}$$

$$\begin{aligned} A_{\circ} &= \frac{1}{2} \pi r^2 \\ &= \frac{1}{2} \cdot 3.14 \cdot 3^2 \\ &= 14.13. \end{aligned}$$

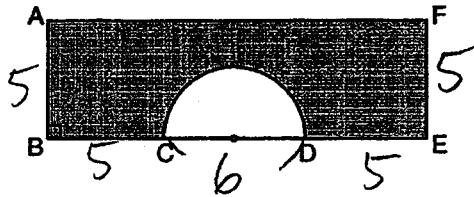
$$80 - 14.13 = 65.87$$

Score: 3

The student rounded π to 3.14, but found appropriate areas.

Practice Papers—Question 39

- 39 In the diagram below of rectangle $AFEB$ and a semicircle with diameter \overline{CD} , $AB = 5$ inches, $AB = BC = DE = FE$, and $CD = 6$ inches. Find the area of the shaded region, to the nearest hundredth of a square inch.



$$(5 \times 16) - \frac{3 \times 3 \times \pi}{2}$$

$$= 80 - \frac{9\pi}{2}$$

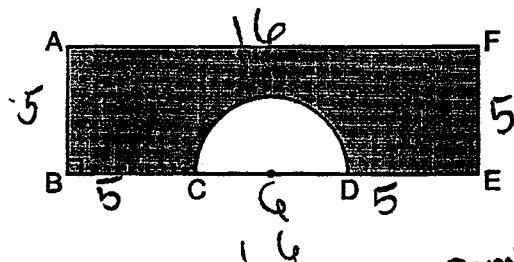
$$A: 80 - \frac{9\pi}{2} \text{ inches}^2$$

Score: 3

The student found the area in terms of π .

Practice Papers—Question 39

39 In the diagram below of rectangle $A FEB$ and a semicircle with diameter \overline{CD} , $AB = 5$ inches, $AB = BC = DE = FE$, and $CD = 6$ inches. Find the area of the shaded region, to the nearest hundredth of a square inch.



Rectangle
 $A = Lw$
 $A = 16(5)$
 $A = 80$

Semicircle
 $A = \frac{2\pi r^2}{2}$
 $A = \frac{56.5486677...}{2}$
 $A \approx 28.27$

80
 $- 28.27$

 51.73

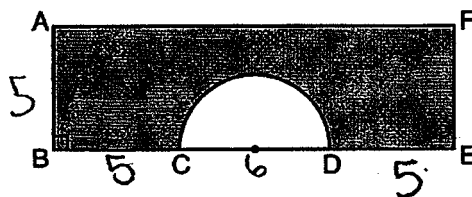
51.73 in.^2

Score: 2

The student made a conceptual error in finding the area of the semicircle by multiplying by 2 on the first step, but found the appropriate area of the shaded region.

Practice Papers—Question 39

39 In the diagram below of rectangle $AFEB$ and a semicircle with diameter \overline{CD} , $AB = 5$ inches, $AB = BC = DE = FE$, and $CD = 6$ inches. Find the area of the shaded region, to the nearest hundredth of a square inch.



$$A = 5 \times 5 \times 16 \times 16$$

$$A = 6,400 \text{ square inches}$$

$$\underline{- 14.14}$$

$$A = 6385.86 \text{ inches}^2$$

semi-circle

$$A = \pi r^2$$

$$A = \pi 3^2$$

$$A = \frac{9\pi}{2}$$

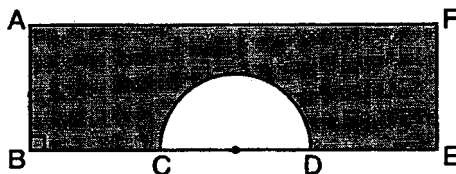
$$A = 14.14$$

Score: 2

The student made a conceptual error in finding the area of the rectangle, but found the appropriate area of the shaded region.

Practice Papers—Question 39

39 In the diagram below of rectangle $AFEB$ and a semicircle with diameter \overline{CD} , $AB = 5$ inches, $AB = BC = DE = FE$, and $CD = 6$ inches. Find the area of the shaded region, to the nearest hundredth of a square inch.



$$\pi r^2 = d$$

$$r = 3 \quad \pi = 3.14$$

$$3.14 \times 9 = 28.26$$

$$BC + CD + DE = BE$$

$$5 + 6 + 5 = 16$$

$$16 \times 5 = 80$$

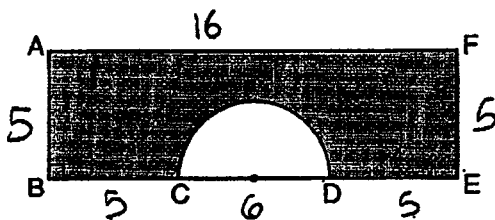
$$80 - 28.26 = 51.74$$

Score: 1

The student made a conceptual error by not dividing the area of the circle by 2, and rounded π to 3.14, but found an appropriate area for the shaded region.

Practice Papers—Question 39

39 In the diagram below of rectangle $AFEB$ and a semicircle with diameter \overline{CD} , $AB = 5$ inches, $AB = BC = DE = FE$, and $CD = 6$ inches. Find the area of the shaded region, to the nearest hundredth of a square inch.



$$a = L \times h$$

$$80$$

$$a = \frac{\pi r^2}{2}$$

$$a = \frac{\pi 6^2}{2}$$

$$a = \frac{\pi 12}{2}$$

$$a = \pi 6$$

$$a = 18.84955592$$

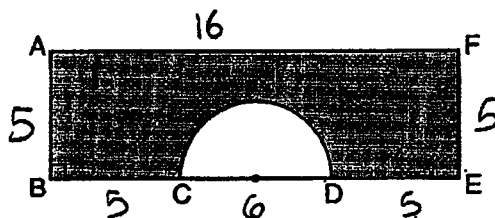
area of shaded region = 61.15 inches

Score: 1

The student found the area of the rectangle as 80, but showed no further correct work.

Practice Papers—Question 39

39 In the diagram below of rectangle $AFEB$ and a semicircle with diameter \overline{CD} , $AB = 5$ inches, $AB = BC = DE = FE$, and $CD = 6$ inches. Find the area of the shaded region, to the nearest hundredth of a square inch.



$$A = l \times h + \frac{1}{2} \pi r^2$$
$$A = (5 + 6 + 5) \times 5 + \frac{1}{2} \pi (3)^2$$

Score: 0

The student showed completely incorrect work.