Math
Spring Operational 2015

Integrated Mathematics II
Performance Based Assessment
Released Items

1. $\triangle ABC$ is dilated from center *A* by a factor not equal to 1 to form $\triangle AKL$. Which of the statements must be true?

Select **all** that apply.

- [ ] A. $\overline{AB}$ and $\overline{AK}$ lie on the same line.
- [ ] B. The line containing $\overline{BC}$ is parallel to the line containing $\overline{KL}$.
- [ ] C. $\angle ABC \cong \angle ACB$
- [ ] D. $\angle ABC \cong \angle AKL$
- [ ] E. $\triangle ABC \sim \triangle AKL$
- [ ] F. $\triangle ABC \cong \triangle AKL$

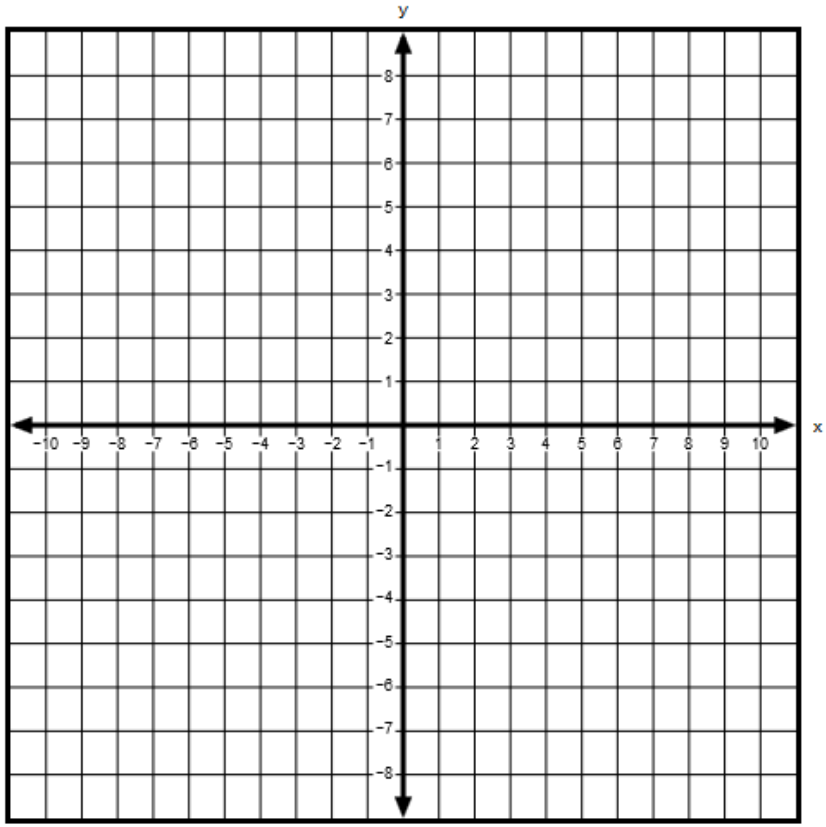
2. A square has sides that are each 90 feet long. Which equations can be used to calculate *d*, the length of a diagonal of the square, in feet?

Select **all** that apply.

- ☐ A. $d = \frac{1}{2}\ (90 \times 90)$
- ☐ B. $d = \sqrt{90^2 + 90^2}$
- ☐ C. $d = \sqrt{4 \times 90^2}$
- ☐ D. $\cos 45^\circ = \frac{90}{d}$
- ☐ E. $\sin 45^\circ = \frac{90}{d}$
- ☐ F. $\tan 45^\circ = \frac{90}{d}$

3. Triangle P is dilated from center A by a scale factor of 2 to form triangle Q. The vertices for triangle P are $(-2, 1), (2, 4)$ and $(2, 1)$. The vertices for triangle Q are $(-1, -3), (7, 3)$ and $(7, -3)$. Graph point A, the center of dilation.

Select the place on the coordinate plane to plot the point.



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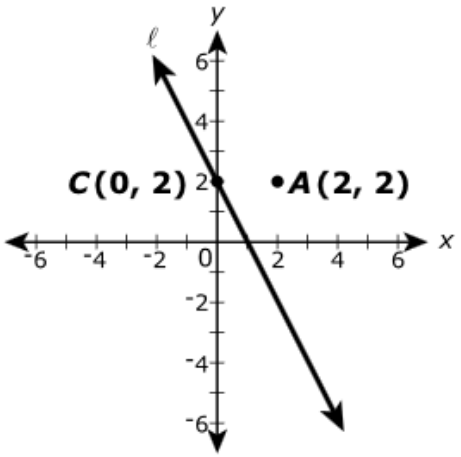
4. In the *xy*-coordinate plane shown, line ℓ passes through point *C* and has a slope of -2.



Enter your answers in the boxes.

A dilation of line ℓ with center *A* and a scale factor of 3 will produce a new line through point C', the image of point *C*, with coordinates ([ ] , [ ]) and with a slope of [ ] .

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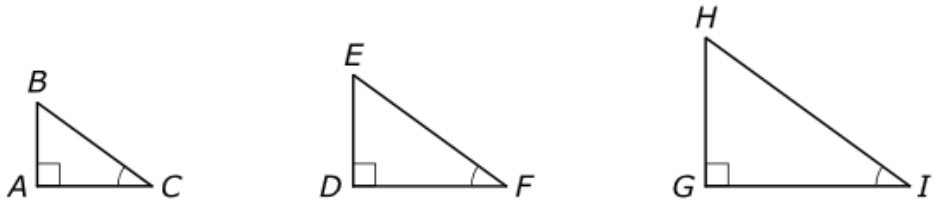
5. In the three right triangles shown, $m\angle C = m\angle F = m\angle I = 36°$.



Complete the statements about the triangles by dragging the correct choices into the proper locations. Not all choices will be used.

Drag and drop the choices into the appropriate boxes.

AA similarity | adjacent leg | ASA | congruent | cosine | CPCTC | GH/GI | GI/GH | hypotenuse | similar | sine | tangent

Because each triangle contains a right angle and a 36° angle, the triangles are [ ] by [ ], and $\frac{AB}{AC} = \frac{DE}{DF} =$ [ ]. The proportion shows that the ratio of the length of the leg opposite the 36° angle to the length of the [ ] will be the same for any right triangle with a 36° angle. The value of the ratio is defined to be the [ ] of 36°.

6. Triangle *ABC* has sides with lengths of 3, 6, and 8. Classify each of the transformations described as producing a triangle **similar** to triangle *ABC* or a triangle **not similar** to triangle *ABC*.

Drag and drop each transformation into the appropriate box.

Multiply each side length by 3.5.	Add 12 to each side length.	Subtract 2 from each side length.	Divide each side length by 0.75.

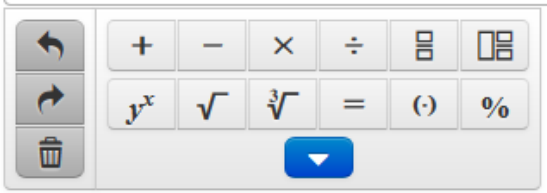
Similar to Triangle *ABC*	Not Similar to Triangle *ABC*

7. What are the solutions to the equation $(2x+1)^2 - (x+13) = 3x^2 - 2x + 2$?

Enter your answers in the spaces provided. Enter **only** your answers.

$x =$ ☐

$x =$ ☐



8. Multiply the polynomials $(x+3)(2x-4)$. What is the product in the form ax^2+bx+c?

Enter your answers in the boxes.

$a =$ ☐

$b =$ ☐

$c =$ ☐

9. Select the values and signs from the drop-down menus that correctly complete the solution by factoring.

$x^2 - 4x + 3 = 0$

$(x$ Choose.. Choose.. $)(x$ Choose.. Choose.. $)$

Choose.. + -

Choose.. 1 2 3 4

Choose.. + -

Choose.. 1 2 3 4

$x =$ Choose.. $; x =$ Choose..

Choose.. -4 -3 1 2

Choose.. -2 -1 3 4

10. Which quadratic equation has nonreal roots?

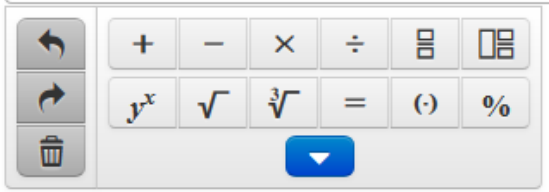
- A. $x^2 - 4x + 3 = 0$
- B. $x^2 - 4x + 4 = 0$
- C. $x^2 - 4x + 5 = 0$
- D. $x^2 - 5x + 6 = 0$

11. For the values listed in the table, i represents the imaginary unit. Select **all** the cells in the table for which the product of the row value and the column value is -1.

Value	i^4	i^5	i^6
i	☐	☐	☐
i^2	☐	☐	☐
i^3	☐	☐	☐

12. What is $\sqrt{-5}$ in the form $a + bi$?

Enter your answer in the space provided. Enter **only** your answer.



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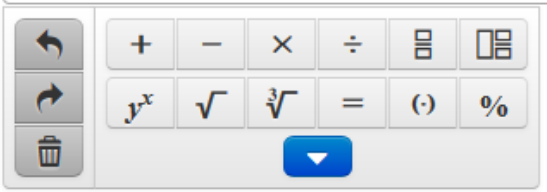
13. One zero for $x^2 - 10x + 169 = 0$ is $x = 5 + 12i$. Find the second zero for $x^2 - 10x + 169 = 0$.

Enter your answer in the space provided. Enter **only** your answer.

$x =$ ☐



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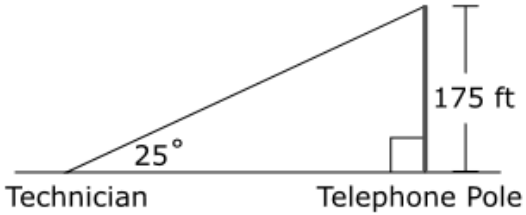
14. A company that manufactures memory chips for digital cameras uses the formula $c = 3\sqrt{n}\left(40\sqrt[6]{n} + 9\sqrt[4]{n}\right)$ to determine the cost, c, in dollars, for producing n chips. This formula can be written as $c = 120\sqrt[3]{n^a} + 27\sqrt[4]{n^b}$, where a and b are constants. What are the values of a and b ?

Enter your answers in the boxes.

$a =$ ☐ , $b =$ ☐

15. A maintenance technician sights the top of a telephone pole at a 25° angle of elevation as shown.



Determine the horizontal distance between the technician and the base of the telephone pole to the nearest tenth of a foot.

Enter your answer in the box.

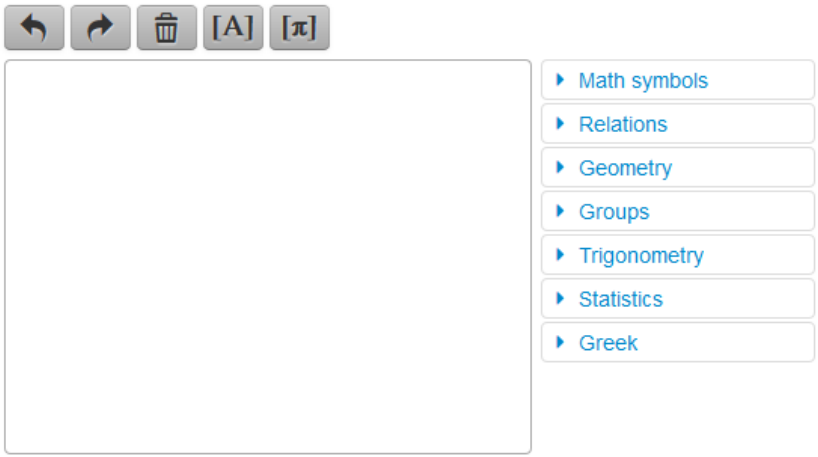
[ ] feet

16. A queen-sized mattress is 20 inches longer than it is wide. A king-sized mattress is 16 inches wider than the queen-sized mattress but has the same length. The area of the king-sized mattress is 1,280 square inches more than that of the queen-sized mattress.

Part A

Write an equation that can be used to determine the area of the king-sized mattress. Define all variables used.

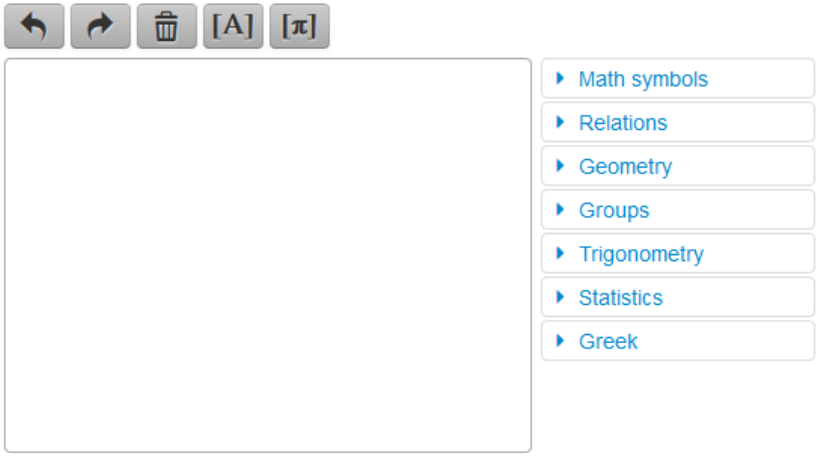
Enter your equation in the space provided.



Part B

Determine the dimensions of the king-sized and queen-sized mattresses. Show your work.

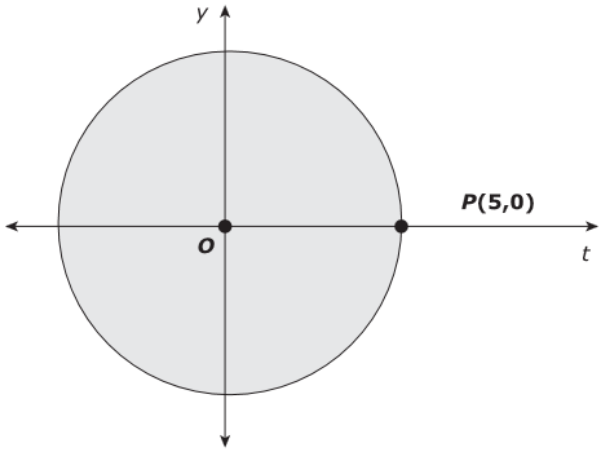
Enter your answer and your work in the space provided.



17. **Part A**

A merry-go-round is set up at a local fair. The merry-go-round moves continuously at a rate slow enough for riders to step on and off of the ride. The pink horse, *P*, moves along the circumference of the ride.

Hal used a coordinate grid to make a rough sketch of the merry-go-round, with the center at the origin. Initially, P is at $P(5,0)$. It takes 30 seconds for P to return to the same place.



Each unit = 1 foot

What is the rate at which the merry-go-round is turning, in feet per minute? Show your work.

Enter your answer and your work in the space provided.

[A] [π]

- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

Part B

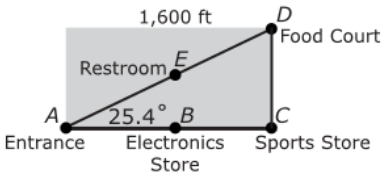
What would be the coordinates of *P* on Hal's sketch after 8.25 minutes?

Enter your answers in the boxes.

(,)

18. **Part A**

Alex is visiting a local shopping mall that has a rectangular shape with a diagonal walkway that goes from the entrance of the mall to the food court. The floor plan is shown.



Alex needs to stop at the sports store on the way to the food court. How much longer, in feet, does he walk than if he walks directly from the entrance to the food court along the diagonal walkway? Show work to justify your answer.

Enter your answer and your work in the space provided.

[A] [π]

- Math symbols
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Part B

A walkway connects the restroom and the sports store. The restroom and electronics store are both at the midpoints of their respective walkways. A separate walkway, which is perpendicular to the walkway between the entrance and the sports store, connects the restroom to the electronics store.

What is the distance, in feet, of the walkway that connects the restroom to the electronics store? Show work to justify your answer.

Enter your answer and your work in the space provided.

[A] [π]

- Math symbols
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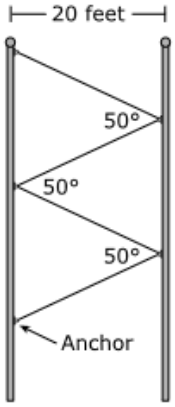
19. City workers will be hanging cable between two poles. The poles are 20 feet apart and perpendicular to the ground. The cable will cross back and forth between equally spaced anchors placed on the poles and will be pulled tight. A section of the design is shown in the figure.



Let n represent the total number of anchors placed on the two poles. Create an expression to represent the length, in feet, of cable needed for n anchors.

Explain how you determined the values in your expression.

Enter your expression and your explanations in the space provided.

[A] [π]

- Math symbols
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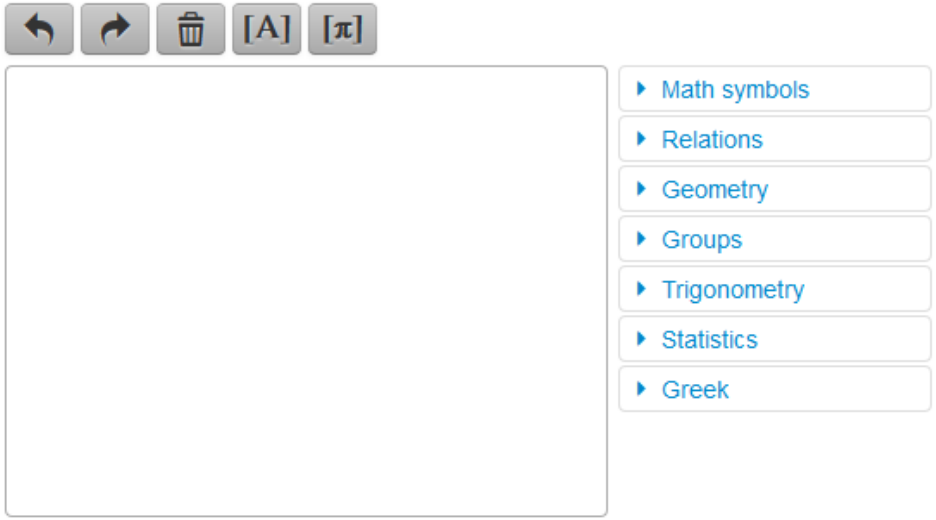
- Greek

20. The above-ground swimming pool in Lien's backyard is shaped like a right circular cylinder with diameter 12 feet and height 4 feet. The pool is filled with water to a height of 3.5 feet. One person who is completely in the water will displace about 18 gallons of water. (Note: 1 cubic foot is approximately 7.48 gallons.)

Lien is inviting high school classmates to swim in the pool. Create a model to determine the greatest number of classmates who can be in the pool before the water overflows. Explain your reasoning.

Enter your model and your explanation in the space provided.



21. A school is holding a raffle to earn money. This list shows all the prizes in the school's raffle.

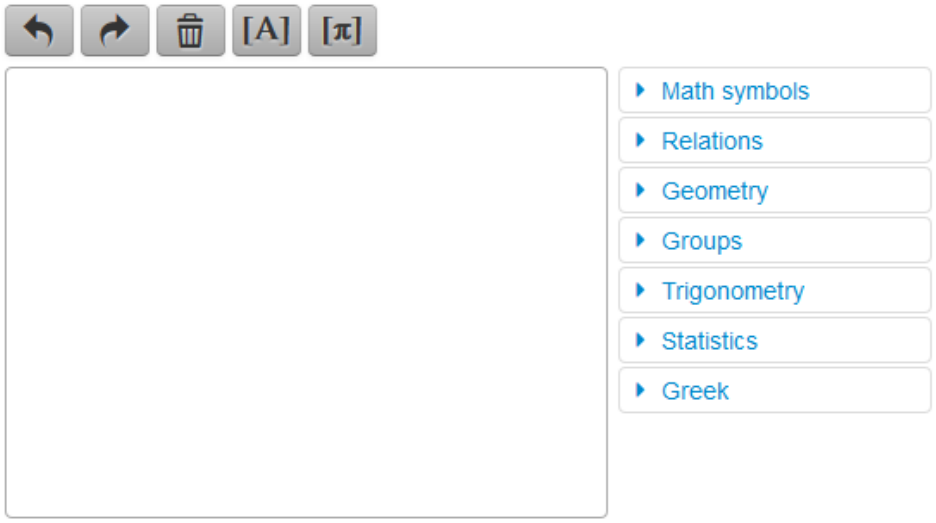
- A computer that costs $349
- A book collection that costs $42
- A gift certificate that costs $25
- A pair of movie tickets that costs $18
- A gift basket that costs $16

The raffle ticket price is set so that 75 raffle tickets will pay for all of the prizes.

Part A

Create a function that can be used to find the total amount of money the school earns by selling *x* tickets. Show your work used to create this function.

Enter your function and your work in the space provided.



Part B

The school's goal is to raise at least $850 more than the total cost of the prizes. What is the minimum number of raffle tickets that have to be sold in order for the school to reach its goal?

Enter your answer in the box.

_____ tickets

22. Two real numbers are defined as:

$$a = 0.444444444444\ldots$$
$$b = 0.354355435554\ldots$$

Determine whether each number is rational or irrational. Is the product of *a* and *b* rational or irrational?

Justify your answers.

Enter your answers and your justifications in the space provided.

- Math symbols
- Relations
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- Greek

23. **Part A**

List the steps to solve the equation $x^2 + 12x - 28 = 0$ by completing the square, and give the solution or solutions.

Enter your work and your answers in the space provided.

[A] [π]

- Math symbols
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- Statistics
- Greek

Part B

Explain what value or values of c make the equation $x^2 + 12x + c = 0$ have one and only one solution. Justify your answer.

Enter your answer and your justification in the space provided.

[A] [π]

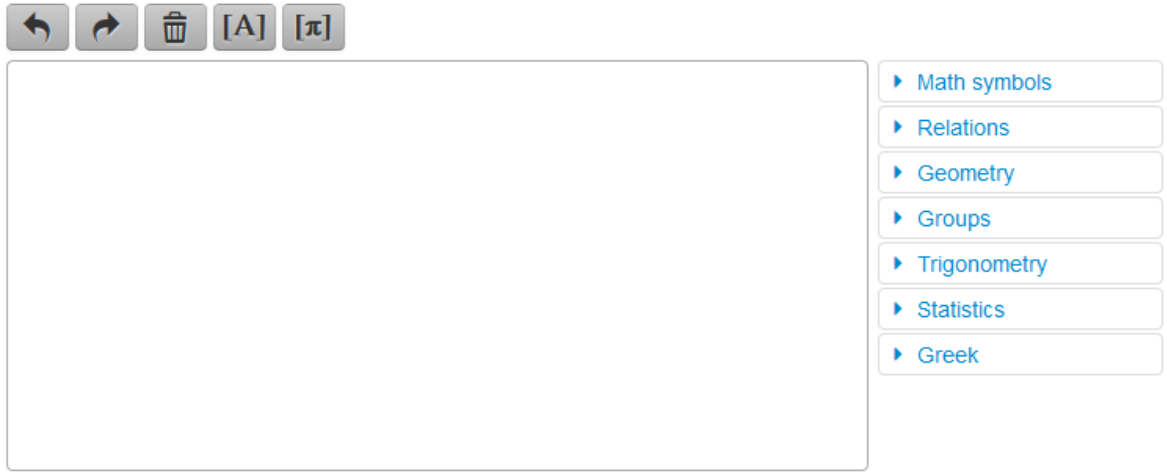
- Math symbols
- Relations
- Geometry
- Groups
- Trigonometry
- Statistics
- Greek

24. Tonya has a rectangular rug with an area of 21 square feet. The rug is 4 feet longer than it is wide.

Part A

Create an equation that can be used to determine the length and the width of the rug. Justify your answer.

Enter your equation and your justification in the space provided.



Part B

Tonya adds a 1.5-foot border all the way around the rug. What is the area of the enlarged rug? Show **all** your work.

Enter your answer and your work in the space provided.