

MPM2D – Unit 4 – Review Worksheet 2

Word Problems

Example - The sum of the squares of two consecutive even numbers is 1060.
Find the value of the numbers.

Practice Questions

1. Two consecutive integers are added. The square of their sum is 361. What are the integers?
2. When the square of an integer is added to ten times the integer, the sum is zero. What is the integer?
3. The hypotenuse of a right triangle is 17 cm long. Another side of the triangle is 7 cm longer than the third side. Determine the unknown lengths.
4. Eighteen more than the square of an integer is 162. Find the integer.
5. The hypotenuse of a right triangle measures 20 cm. The sum of the lengths of the other two sides is 28 cm. Find the lengths of these two sides.

Answers

1. 9, 10 or -9, -10
2. 0 or -10
3. 8 cm, 15 cm
4. 12 or -12
5. 12 cm, 16 cm

Example - The length of a Ping-Pong table is 3 feet more than twice the width. The area of the Ping-Pong table is 90 ft^2 . What are the dimensions of the Ping-Pong table?

Practice Questions

1. A rectangle has a length 5 cm less than its width. The area of the rectangle is 36 cm^2 . Find the dimensions of the rectangle.
2. The length and width of a rectangle are 6 m and 4 m. When each dimension is increased by the same amount, the area of the new rectangle is 50 m^2 . Find the dimension so of the new rectangle, to the nearest tenth of a metre.
3. If part of a photograph is used to fill an available space in a book or magazine, the photographs is said to be cropped. A photograph that was originally 15 cm by 10 cm is cropped by removing the same width from the top and left side. Cropping reduces the area by 46 cm^2 . What are the dimensions of the cropped photograph?
4. A rectangular lawn measuring 8 m by 4 m is surrounded by a flower bed of uniform width. The combined area of the lawn and the flower bed is 165 m^2 . What is the width of the flower bed?
5. Alex the photographer has a 20 cm by 15 cm photograph that he is going to crop. The same amount was cropped from all sides. The new area of the photo has been reduced by 99 cm^2 . What are the new dimensions of the photograph to the nearest tenth of a centimeter?
6. The length of a rectangular flower garden is 5 feet more than its width. If the area of the garden is 104 square feet, find the dimensions of the flower garden.
7. Mr. T upon passing the inspection with glowing colours, is showered with money (and adulation). One of his first purchases, unfortunately, is a gaudy rug for the 5th floor student lounge. The rug has a central area made up of a trampled Leaf emblem measuring 8 m by 9 m. This is surrounded by a "Go Canucks Go" border of uniform width. If the whole rug has an area of 306 m^2 , how wide is the border?

Answers

1. 9 cm by 4 cm
2. $L = 8.1 \text{ m}$, $W = 6.1 \text{ m}$
3. 13 cm by 8 cm
4. 3.5 m
5. 16.9 cm by 11.9 cm
6. 8 feet by 13 feet
7. 4.5 m^2

Example - A farmer has 1800 metres of fencing and wants to build a large rectangular pen, divided in half by a fence parallel to one of the sides. What are the dimensions of the pen that will maximize area?

Practice Questions

1. A rectangular field is to be enclosed by a fence and divided into 2 rectangular fields by a fence parallel to one side of the field. If 1200 m of fence are available, find the dimensions of the field giving the maximum area.
2. A lumber company wants to fence off an area for storing materials, one side of which is the wall of a building. What is the maximum storage area they can obtain from 180 m of fencing and what are the dimensions of the yard?
3. A homesteader is offered as much land as he can enclose in a rectangular plot, one side of which is to lie along the straight bank of a river. Find the area of the largest such plot he can obtain if he has 2400 m of fencing to use and doesn't fence the river side.
4. The perimeter of a rectangle is 70 m. What are the dimensions that will produce the maximum area of such a rectangle?
5. A large rectangular corral is to be made and split into three equal parts with 800 m of fencing.
 - a. Determine the dimensions that will produce the maximum area.
 - b. What is the area of one part of the corral?
6. If a farmer digs up his potatoes on July 1, his crop will be 120 bushels which will sell as new potatoes at \$3 per bushel. If the crop is allowed to mature it will increase at 15 bushels per week. However, the price will drop 20 cents per bushel per week. Using the revenue equation, $R = -3x^2 + 21x + 360$, when should he dig the crop for maximum cash return?
7. A company's weekly revenue in dollars is given by $R = -2x^2 + 2000x$, where x is the number of items produced during a week. What amount of items will produce the maximum revenue?

Answers

1. 200 m by 300 m
2. 4050 m², 45 m by 90 m
3. 720 000 m²
4. 17.5 m by 17.5 m
5. 100 m by 200 m, 20 000 m²
6. 3.5 weeks
7. 500 items

Example - The height h , in metres, of a projectile is given by the equation $h = -3d^2 + 24d + 10$, where d is the horizontal distance, in metres, from where the projectile was launched.

- a. What was the initial height of the projectile?
- b. What is the maximum height of the projectile?
- c. Where does the projectile reach a height of 41 m?

Practice Questions

1. The height h , in metres, of a football is given by $h = -0.7d^2 + 8.4d + 1.6$, where d is the horizontal distance, in metres, from where it was thrown.
 - a) Determine how far it has traveled when it hits the ground.
 - b) Determine how far it has traveled when it reaches a height of 23 m.
2. The height h , in metres, of a snowboarder above the ground is given by $h = -4.9(t - 1.8)^2 + 20$, where t is the time, in seconds, since the snowboarder left a jump.
 - a) Determine the initial height of the snowboarder.
 - b) Determine when the snowboarder was 16 m above the ground.
 - c) Determine when the snowboarder landed on the ground.
3. A projectile is shot straight up from a height of 6 m with an initial velocity of 50 m/s. Its height is given by $h = 6 + 50t - 5t^2$. When does it reach its maximum height and what is the maximum height?
4. If a farmer harvests his crop today he will have 800 baskets worth \$2 per basket. Every week he waits the crop increases by 200 baskets but the price drops by 20 cents per basket. How many weeks should the farmer wait to harvest and maximize profit if the profit is represented by the equation, $P = -40x^2 + 240x + 1600$.
5. The sum of the squares of three consecutive odd integers is 683. Determine these integers.
6. The square of the sum of three consecutive odd integers is 729. Determine these integers.
7. An area rug has a central 5 m by 3 m rectangle in a mosaic pattern, with a plain border of uniform width around it. The total area of the rug is 24 m^2 . Find the width of the border.
8. The length of a rectangular plot of land is 10 yards more than its width. If the area of the land is 600 square yards, find the dimensions of the plot of land.
9. Three hundred feet of fencing is available to enclose a rectangular yard along the side of the St. John's River. The river acts as one side of the rectangle and does not need to be fenced. What is the maximum area that can be enclosed?

10. The height of a right angle triangle is 31 units more than the length of the base. The hypotenuse is 11 units less than double the length of the base. Determine the lengths of the three sides of this right angle triangle.
11. A banquet hall charges \$12 a plate for a crowd of 200 people. They agree however to reduce the cost per plate by 5 cents for each extra person over 200. The revenue equation for this scenario is $R = -0.05x^2 + 2x + 2400$ where x is the number of people over 200 and R is the revenue earned. What number of people will bring the greatest income?
12. Cyclone Motors manufacturers custom built cars. The cost in dollars per car “ y ” of the Super Zap model depends on the number “ x ” of cars made where $y = x^2 - 72x + 7600$.
- Find the most economical number of Super Zaps that can be made.
 - Find the minimum cost.
13. The number of horsepower needed to overcome a wind drag on a certain automobile is given by $N(s) = 0.005s^2 + 0.007s - 0.031$, where s is the speed of the car in miles per hour.
- How much horsepower is needed to overcome the wind drag on this car if it is traveling 50 miles per hour?
 - At what speed will the car need to use 200 horsepower to overcome the wind drag?

Answers

- 8. a) 12.19 m
b) 3.67 m and 8.33 m
- 9. a) 4.12 m
b) 0.90s and 2.70 s
c) 3.82 s
- 10. 5 seconds, 131 m
- 11. 3 weeks
- 12. 13, 15, 17
- 13. 7, 9, 11
- 14. 0.5 m
- 15. 20 yards by 30 yards
- 16. 11 250 ft²
- 17. 60, 91, 109
- 18. 220 people
- 19. 36, \$6304
- 20. 12.82 horsepower, 199.32 miles per hour