

Ch. 9 Word Problems

1. volume

Example

Velocity and Area

1. A flare is launched from a life raft with an initial velocity of 144 feet per second. How many seconds will it take for the flare to return to the sea?



explore

Use the formula $h = vt - 16t^2$.

The variable h represents the height of the flare in feet when it returns to the sea. Thus, $h = 0$.

The variable v represents the initial velocity of the flare, in feet per second.

Thus, $v = 144$.

plan

Substitute the appropriate values into the formula.

solve

$$0 = 144t - 16t^2$$

$$0 = 16(9 - t)$$

$$16t = 0 \quad \text{or} \quad 9 - t = 0$$

$$t = 0 \quad \text{or} \quad 9 = t$$

examine

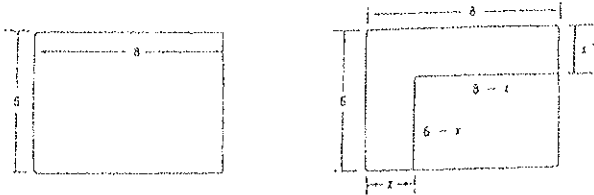
The flare returns to the sea in 9 seconds. The answer 0 is not reasonable since it represents the time when the flare is launched.

Let a flare be launched from ground level. It reaches its maximum height in 9 seconds. At a time halfway between launch and impact times, its height above the ground after t seconds is given by the formula $h = vt - 16t^2$. In this formula, h represents the height of the object in feet, v represents the initial velocity in feet per second. Thus, the height of an object with an initial velocity of 144 feet per second is given by the formula $h = 144t - 16t^2$.

Example

7. Pat Bing has a photograph that is 8 cm long and 6 cm wide. Pat wants to reduce the length and width of the photo by the same amount. She also wants the reduced photo to have half the area of the original photo. By what amount should she reduce the length and width?

Let x = the amount the length and width should be reduced.



The dimensions of the reduced photo will be $(8 - x)$ cm and $(6 - x)$ cm.

The area of the photo is $8 \cdot 6$, or 48 cm^2 .

The area of the reduced photo will be $\frac{48}{2}$, or 24 cm^2 .

$$\text{length} \cdot \text{width} = \text{area}$$

$$(8 - x)(6 - x) = 24$$

$$48 - 8x - 6x + x^2 = 24$$

$$x^2 - 14x + 48 = 24$$

$$x^2 - 14x + 24 = 0$$

$$(x - 12)(x - 2) = 0$$

$$x - 12 = 0 \quad \text{or} \quad x - 2 = 0$$

$$x = 12 \quad \text{or} \quad x = 2$$

Substitute the appropriate values into the formula

Solve the equation

Why is 12 cm not a reasonable answer?

Pat should reduce the length and width by 2 cm each.

The dimensions of the reduced photo will be $8 - 2$, or 6 cm and $6 - 2$, or 4 cm.

Area

12) Mr. Steinborn wants to double the area of his garden by adding a strip of uniform width along each of the four sides. The original garden is 10 ft by 15 ft. How wide a strip must be added?

1) A strip of uniform width is plowed along both sides and both ends of a garden 120 ft by 90 ft. How wide is the strip if the garden is half plowed?

Velocity

Use $h = vt - 16t^2$ to find the missing quantity

- 1) Find v , if $t = 5$ seconds and $h = 480$ feet.
- 2) Find h , if $t = 7$ seconds and $v = 1700$ feet per second.
- 3) Find two values for t , if $v = 160$ feet per second and $h = 336$ feet.

- 4) Find v , if $t = 8$ seconds and $h = 32$ feet.
- 5) Find h , if $t = 2$ seconds and $v = 110$ feet per second.
- 6) Find two values for t , if $v = 120$ feet per second and $h = 224$ feet.

Use the formula $h = vt - 16t^2$ to solve each problem

7) A flare is launched from a life raft with an initial velocity of 192 feet per second. How many seconds will it take for the flare to return to the sea?

8) A missile is fired with an initial velocity of 2320 feet per second. When will it be 40,000 feet high?

9) A rocket is fired with an initial velocity of 1640 feet per second. When will it be 816 feet high?

10) A golf ball is hit into the air with an initial velocity of 64 feet per second. How many seconds will it take for the golf ball to hit the ground?

11) A rocket is fired with an initial velocity of 1920 feet per second. When will it be 32,000 feet high?

12) A flare is launched with an initial velocity of 128 feet per second. How many seconds will it take the flare to return to the sea?

For each problem, define a variable. Then use an equation to solve the problem.

- 15) The area of Jane Redfern's living room is 40 m^2 . The length of the room is 3 m more than the width. What are its dimensions?
- 16) The length of Mrs. Boland's garden is 5 yards more than its width. The area of the garden is 234 square yards. What are its dimensions?
- 17) A rectangle is 4 in. wide and 7 in. long. When the length and width are increased by the same amount, the area is increased by 26 in^2 . What are the dimensions of the new rectangle?
- 18) A photo is 8 cm wide and 12 cm long. The length and width are increased by an equal amount in order to double the area of the photo. What are the dimensions of the new photo?
- 19) Bill McClure is making a picture frame whose length will be 4 in. greater than its width. The frame will have a uniform width of 2 in. If the area of the frame will be 192 square inches, what will the inside dimensions of the picture frame be?

For each problem below, define a variable. Then use an equation to solve the problem.

- 20) Find two consecutive even integers whose product is 120.
- 21) Find two consecutive even integers whose product is 360.
- 22) Find two consecutive positive odd integers whose product is 195.
- 23) Find two consecutive odd integers whose product is 399.
- 24) Find two consecutive positive integers whose product is 182.
- 25) Find two consecutive positive integers whose product is 272.
- 26) Find two integers whose sum is 11 and whose product is 24.
- 27) Find two integers whose sum is 19 and whose product is 60.
- 28) Find two integers whose difference is 3 and whose product is 88.
- 29) Find two integers whose difference is 23 and whose product is -120 .
- 30) The sum of the squares of two consecutive positive odd integers is 202. Find the integers.
- 31) The sum of the squares of two consecutive positive integers is 113. Find the integers.