

Exam 1

(20 points each, 100 points total)

NAME _____

1 gallon = 231 cubic inches

60 seconds = 1 minute

60 minutes = 1 hour

12 inches = 1 foot

1609 meters = 1 mile

2.54 cm = 1 inch

Volume of a cylinder = $\pi r^2 h$ Area of a circle = πr^2

SHOW YOUR WORK and PUT YOUR ANSWER IN THE BOX!

1. A backyard swimming pool is three feet deep and has a diameter of 15 feet. How many gallons does it hold?



$$\text{Volume of a cylinder} = \pi r^2 h = \pi (7.5 \text{ ft})^2 (3 \text{ ft}) = 530.9 \text{ ft}^3$$

Converting the units of this volume we get

$$v = 530.9 \text{ ft}^3 \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{12 \text{ in}}{1 \text{ ft}} \times \frac{1 \text{ gal}}{231 \text{ in}^3} = 3980 \text{ gallons}$$

3980 gallons

2. A car accelerates from 0 to 60 mph in four seconds. What is the average acceleration of the car in units of m/sec^2 ?

$$a = \frac{15 \text{ mi}}{\text{hour} \cdot \text{sec}} \times \frac{1 \text{ hour}}{3600 \text{ sec}} \times \frac{1609 \text{ m}}{1 \text{ mi}} = 6.7 \text{ m/sec}^2$$

6.7 m/sec²

3. An 8-foot ladder is leaning up against a wall. The ladder touches the wall 6 feet above the ground.

- a) What is the angle the ladder makes with the ground?
 b) What is the distance from the base of the ladder to the base of the wall?

$$\sin \theta = \frac{\text{opp}}{\text{hyp}} = \frac{6 \text{ ft}}{8 \text{ ft}} ; \theta = \arcsin \frac{3}{4} ; \theta = 53^\circ$$

Using the Pythagorean theorem...

$$c^2 = a^2 + b^2$$

$$(8 \text{ ft})^2 = (6 \text{ ft})^2 + b^2$$

$$b = \sqrt{28 \text{ ft}^2} = 5.3 \text{ ft}$$

a) 53°

b) 5.3 ft

4. Three seconds after it was thrown, a baseball has a horizontal speed component of 22 m/sec and a vertical speed component of -14 m/sec.

- a) What is the speed of the baseball?
 b) What direction, relative to the horizontal, is the baseball moving?

Using the Pythagorean theorem...

$$c^2 = a^2 + b^2$$

$$c^2 = (22 \text{ m/sec})^2 + (-14 \text{ m/sec})^2$$

$$c = \sqrt{680 \text{ m}^2/\text{sec}^2} = 26.1 \text{ m/sec}$$

Using the Pythagorean theorem...

$$\theta = \arctan \frac{-14 \text{ m/sec}}{22 \text{ m/sec}} = \arctan \frac{-7}{11}$$

$$\theta = 32.4^\circ \text{ below the horizontal}$$

a) 26.1 m/sec

b) 32° below horizontal

5. A square 100-cm² aluminum pan is heated, and the area increases by 3%. (Give your answers to 4 decimal places.)

- a) What is the side length of the *un*heated pan in inches?
b) What is the side length of the heated pan in unit of inches?

a) Must be 10 cm

b) $A_f = 1.03 A_i = 103 \text{ cm}^2$

$$s^2 = 103 \text{ cm}^2$$

$$s = \sqrt{103 \text{ cm}^2} = 10.15 \text{ cm}$$

$$s = 10.15 \text{ cm} \times \frac{1 \text{ inch}}{2.54 \text{ cm}} = 4.00 \text{ inches}$$

a) **10 cm**

b) **4.00 inches**