

## Chapter 11 Study guide

Simplify each radical expression.

1.  $\sqrt{16} * \sqrt{8}$

$$4 \cdot 2\sqrt{2}$$

$$\boxed{8\sqrt{2}}$$

2.  $4\sqrt{144}$

$$4 \cdot 12$$

$$\boxed{48}$$

3.  $\sqrt{\frac{12}{36}}$

option 1

$$\frac{2\sqrt{3}}{6} = \frac{\sqrt{3}}{3}$$

option 2  
simplify fraction

$$\sqrt{\frac{1}{3}} = \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$$

4.  $\frac{2}{\sqrt{a^5}} = \frac{2}{a^2\sqrt{a}} \cdot \frac{\sqrt{a}}{\sqrt{a}} = \frac{2\sqrt{a}}{a^3}$

5.  $\frac{\sqrt{3x}}{\sqrt{15x^3}}$

$$= \sqrt{\frac{3x}{15x^3}} = \sqrt{\frac{1}{5x^2}} = \frac{1}{x\sqrt{5}} \cdot \frac{\sqrt{5}}{\sqrt{5}}$$

$$\boxed{\frac{\sqrt{5}}{5x}}$$

6.  $\sqrt{\frac{13}{64}}$

$$\boxed{\frac{\sqrt{13}}{8}}$$

7.  $12\sqrt{16} - 2\sqrt{16}$

$$12 \cdot 4 - 2 \cdot 4$$

$$\boxed{40}$$

8.  $\sqrt{20} - 4\sqrt{5}$

$$2\sqrt{5} - 4\sqrt{5}$$

$$\boxed{-2\sqrt{5}}$$

9.  $2(\sqrt{2} + 3\sqrt{3})$

$$\boxed{2\sqrt{2} + 6\sqrt{3}}$$

10.  $(\sqrt{3} - 2\sqrt{21})(\sqrt{3} + 3\sqrt{21})$

$$\sqrt{3} \cdot \sqrt{3} + \sqrt{3} \cdot 3\sqrt{21} - 2\sqrt{21} \cdot \sqrt{3} + 2\sqrt{21} \cdot 3\sqrt{21}$$

$$3 + 9\sqrt{7} - 6\sqrt{7} + 126$$

$$\boxed{129 + 3\sqrt{7}}$$

11.  $\frac{16}{\sqrt{5} - \sqrt{7}}$

Level 4

$$\frac{16}{\sqrt{5} - \sqrt{7}} \cdot \frac{\sqrt{5} + \sqrt{7}}{\sqrt{5} + \sqrt{7}}$$

$$\frac{16\sqrt{5} + 16\sqrt{7}}{5 - 7} = \frac{16\sqrt{5} + 16\sqrt{7}}{-2} = \boxed{-8\sqrt{5} - 8\sqrt{7}}$$

Solve each radical equation.

13.  $\sqrt{7x-4} = 4$   
 $7x-4 = 16$   
 $7x = 20$   
 $x = \frac{20}{7}$

Check:  
 $\sqrt{\frac{20}{7}-4} = 4$   
 $\sqrt{\frac{20-28}{7}} = 4$   
 $\sqrt{\frac{-8}{7}} = 4$  (Incorrect)

14.  $\sqrt{3x-2} = \sqrt{x+2}$   
 $3x-2 = x+2$   
 $-x+2 = -x+2$   
 $2x = 4$   
 $x = 2$

Check:  
 $\sqrt{3 \cdot 2 - 2} = \sqrt{2+2}$   
 $\sqrt{6-2} = \sqrt{4}$   
 $\sqrt{4} = \sqrt{4}$  ✓

15.  $\sqrt{2x+7} = \sqrt{5x-8}$   
 $2x+7 = 5x-8$   
 $-2x+8 = -2x+8$   
 $15 = 3x$   
 $5 = x$

Check:  
 $\sqrt{2 \cdot 5 + 7} = \sqrt{5 \cdot 5 - 8}$   
 $\sqrt{10+7} = \sqrt{25-8}$   
 $\sqrt{17} = \sqrt{17}$  ✓

16.  $x = \sqrt{2x+8}$  Level 4 question

$x^2 = 2x+8$   
 $x^2 - 2x - 8 = 0$

$(x-4)(x+2) = 0$   
 $x = 4$  and  $x = -2$  ← Extraneous

Check  
 $4 = \sqrt{2 \cdot 4 + 8}$   
 $4 = \sqrt{8+8}$  ✓  
 $-2 = \sqrt{2 \cdot (-2) + 8}$   
 $-2 = \sqrt{-4+8}$  ✗

17.  $\sqrt{3x+4} + 5 = 3$   
 $-5 = -5$   
 $\sqrt{3x+4} = -2$

No Solution

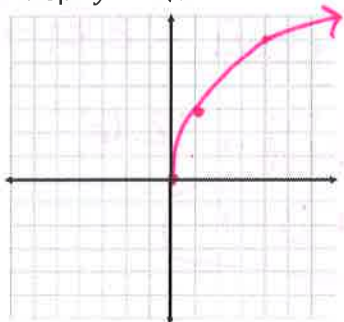
**Graphing Radical Equations** From this point on all questions will relate to level 4/Advanced understanding questions

18. Find the domain of the function  $f(x) = \sqrt{2x-4}$

$2x-4 \geq 0$   
 $2x \geq 4$   
 $\frac{2x}{2} \geq \frac{4}{2}$   
 $x \geq 2$

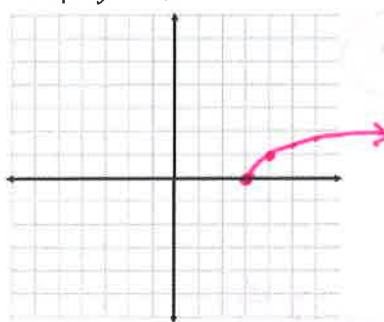
Domain  
 $x \geq 2$   
 $[2, \infty)$

19. Graph  $y = 3\sqrt{x}$



x	y
0	0
1	$3\sqrt{1} = 3 \cdot 1 = 3$
4	$3\sqrt{4} = 3 \cdot 2 = 6$

20. Graph  $y = \sqrt{x-3}$



x	y
3	$\sqrt{3-3} = 0$
4	$\sqrt{4-3} = \sqrt{1} = 1$
5	$\sqrt{5-3} = \sqrt{2} \approx 1.4$
6	$\sqrt{6-3} = \sqrt{3} \approx 1.7$

Describe how to translate the following graphs from  $y = \sqrt{x}$

21.  $y = \sqrt{x - 15}$

Translates the graph 15 units to the right

23.  $y = \sqrt{x + 20}$

Translates  $y = \sqrt{x}$  20 units to the left

22.  $y = \sqrt{x} + 4$

Translates the graph up 4 units

24.  $y = -7 + \sqrt{x}$

Translates the graph 7 units down.

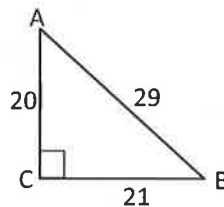
**Trigonometric Ratios**

25. Use the figure to find

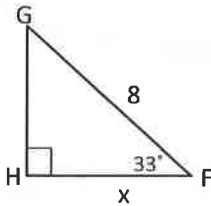
a.  $\sin A = \frac{21}{29}$

b.  $\cos A = \frac{20}{29}$

c.  $\tan A = \frac{21}{20}$



26. Find the value of x to the nearest tenth.



Use cosine because you were given the adjacent side and the hypotenuse.

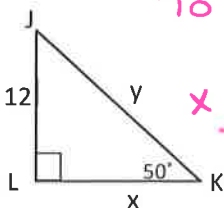
$$\cos(33) = \frac{x}{8}$$

$$8 \cdot \cos(33) = x$$

$$6.709 = x$$

$x = 6.7$  units

27. Find the value of x and y to the nearest tenth



To find x use tangent to find y use sine

$$x \cdot \frac{\tan(50)}{\tan(50)} = \frac{12}{x} \cdot \frac{x}{\tan(50)}$$

$$x = \frac{12}{\tan(50)} \quad x = 10.069$$

$x = 10.1$  units

$$y \cdot \frac{\sin(50)}{\sin(50)} = \frac{12}{y} \cdot \frac{y}{\sin(50)}$$

$$y = \frac{12}{\sin(50)}$$

$$y = 15.6648$$

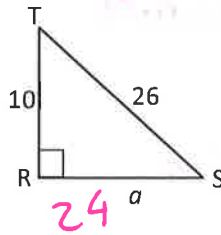
$y = 15.7$  units

28. Find the value of the variable, then find

a.  $\sin T = \frac{24}{26} = \frac{12}{13}$

b.  $\cos T = \frac{10}{26} = \frac{5}{13}$

c.  $\tan T = \frac{24}{10} = \frac{12}{5}$



$10^2 + a^2 = 26^2$   
 $100 + a^2 = 676$   
 $a^2 = 576$   
 $a = 24$

**Angles of Elevation and Depression**

29. A park ranger on a 220ft tower spots a fire at an angle of depression of  $4^\circ$ . How far is the fire from the base of the tower? Draw and label a diagram, then round to the nearest foot.

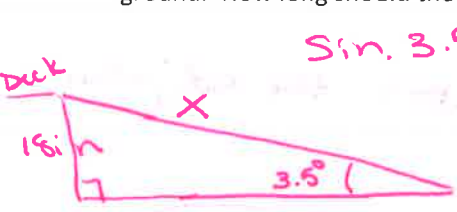


$\tan(86) = \frac{x}{220}$

$220 \cdot \tan(86) = x$   
 $3146.146 = x$

the fire is about 3,146 ft away

30. A wheelchair ramp is to have an angle of  $3.5^\circ$  with the ground. The deck at the top of the ramp is 18in above the ground. How long should the ramp be? Draw and label a diagram, then round to the nearest inch.

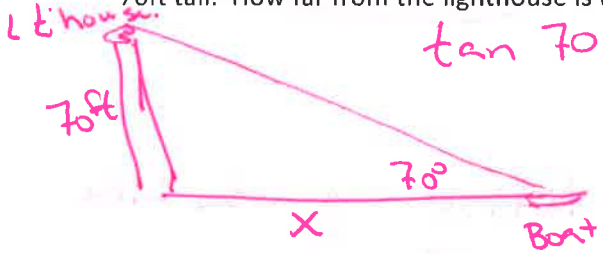


$\sin 3.5 = \frac{18}{x}$

$x = \frac{18}{\sin 3.5}$   
 $x = 294.847$

The ramp needs to be about 295 inches long.

31. Suppose the angle of elevation from a rowboat to the top of a lighthouse is  $70^\circ$ . You know the lighthouse is 70ft tall. How far from the lighthouse is the rowboat? Draw and label a diagram, then round to the nearest foot.

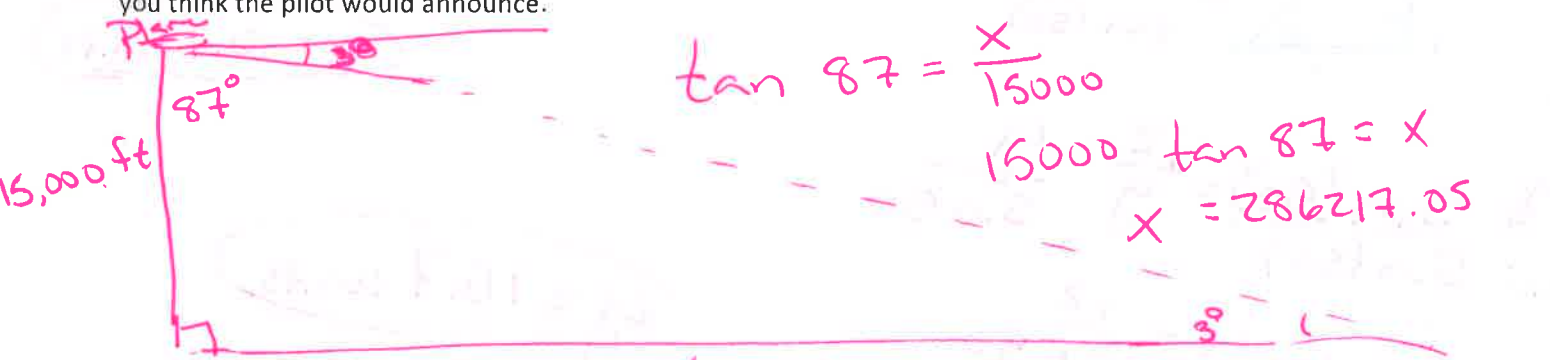


$\tan 70 = \frac{70}{x}$

$x = \frac{70}{\tan 70}$   
 $x = 25.477$

The boat is approximately 25 ft from the lighthouse

32. A pilot is flying a plane 15,000ft above the ground. The pilot begins a  $3^\circ$  descent to the runway. How far is the airplane from the start of the runway (in ground distance)? Draw and label a diagram, then round to the nearest foot you think the pilot would announce.



$\tan 87 = \frac{x}{15000}$

$15000 \cdot \tan 87 = x$   
 $x = 286217.05$

The plane is 286,217 feet from the runway and the pilot would probably use miles in this case.