Algebra Practice Problems for MDPT Pre Calculus

1. Simplify $\sqrt[3]{2x^5}\sqrt[4]{64x^2}$

   a. $\sqrt[12]{128x^{10}}$ b. $\sqrt[7]{128x^7}$ c. $2x^2\sqrt[6]{32x}$ d. $8x\sqrt[12]{2x^4}$

2. Solve $-\frac{1}{2}(2x-3)+\frac{x}{3}=\frac{3}{4}(x-1)+\frac{1}{9}$

   a. $77/51$ b. $-23/17$ c. $23/17$ d. $23/51$

3. Simplify $(x^{a-b})^{a+b}\,(x^a)^{-a}\,(x^{-b})^{a-b}$

   a. $x^{2a-ab-2b}$ b. x^{-ab}

   c. $3x^{2a-2b}$ d. x^{-3ab}

4. Simplify $\frac{(-3x^2y)^6}{(6x^3y^2)^4}$

   a. $\frac{1}{16x^4y^4}$ b. $\frac{9}{8xy}$ c. $\frac{x}{2y^2}$ d. $\frac{9}{16y^2}$

5. Solve $2+\frac{3}{x^2}=\frac{1}{x}$

   a. -1 or 3/2 b. 2/3 or 1 c. -3/2 d. -1

6. Factor $x^4 - 81$

   a. $(x-3)^2\,(x+3)^2$ b. $(x-3)\,(x+3)\,(x^2+9)$

   c. $(x^2-9)\,(x^2-9)$ d. $(x+3)^2\,(x-3)\,(x+3)$

7. Simplify $(5-4t)\,(3+5t)$

   a. $-5+5t-3t^2$ b. $15-13t+20t^2$

   c. $35+13t^2$ d. $15+13t-20t^2$

8. Solve $\frac{8}{a^2-16}+\frac{1}{4-a}=\frac{a}{a+4}$

   a. $\frac{5\pm\sqrt{73}}{2}$ b. -1 c. $\frac{2}{3}$ and 1 d. 4 and -1

9. Find the x-intercepts of the parabola $y = x^2 - 3x + 4$

a. x = -1 or 4 b. x = -4 or 1

c. $x = \frac{3 \pm i\sqrt{7}}{2}$ d. none

10. Solve $4^{2x-1} + 8 = 40$ for x.

a. $3/2$ b. $7/4$ c. $2/3$ d. 3

11. Simpify the imaginary equation $\frac{3-2i}{4-3i}$

a. $\frac{16+9i}{5}$ b. $\frac{5}{16+9i}$ c. $-\frac{25}{18+i}$ d. $\frac{18+i}{25}$

12. Solve $|2x+4| \geq 6$

a. $x \geq -5$ and $x \geq 1$ b. $x \leq -5$ or $x \leq 1$

c. $x \leq -5$ or $x \geq 1$ d. $x \geq -5$ and $x \leq 1$

13. Find f(2p - 1) if $f(x) = 3x^2 - 5x + 1$

a. $12p^2 - 22p + 9$ b. $12p^2 - 10p + 3$

c. $12p^2 - 10p - 7$ d. $12p^2 - 22p - 3$

14. Find p if $f(x) = 12x^2 - 3px$ and 2 is a root of f(x).

a. 6 b. 42 c. 4 d. 8

15. Solve $x(x - 3) = 2$

a. $2 \pm \sqrt{22}$ b. $\frac{3 \pm \sqrt{17}}{2}$ c. $\frac{3 \pm \sqrt{17}}{3}$ d. $\frac{3 \pm \sqrt{21}}{2}$

16. Find the center and radius of the circle $x^2 + 4x + y^2 - 6y = 3$

a. c = (2,-3), r=16 b. c = (-2,3), r=4

c. c = (4,-6), r=3 d. c = (-4,6), r=9

17. Solve $\frac{\sqrt{2}}{3-\sqrt{2}}$

a. $\frac{3\sqrt{2}-3}{7}$ b. $\frac{3\sqrt{2}+2}{7}$ c. $\frac{7}{3+\sqrt{2}}$ d. $\frac{3\sqrt{2}-7}{2}$

18. If $f(x) = x^2 - 1$ and $g(x) = 2x + 7$, find $\frac{g}{f}(-1)$

a. 0 b. $-\frac{5}{2}$ c. undefined d. -1

19. Find the domain of the function $h(x) = \sqrt{3x-9}$?

a. $x \geq 3$ b. $x \leq 3$ c. $x \geq 9$ d. $x \leq 9$

20. Solve $\sqrt{x+1} = x - 1$

a. 1 and -1 b. 0 and 3 c. 3 d. -1

21. Solve $\sqrt{5x-1} + \sqrt{x+3} = 4$

a. 13 b. no solution c. 1 and 13 d. 1

22. Solve the system:

$$\frac{x}{3} + \frac{y}{6} = \frac{2}{3}$$
$$\frac{2}{5}x + \frac{y}{4} = \frac{1}{5}$$

a. (8,-12) b. (3,-4) c. (1,2) d. (-3,4)

23. Solve $x^2 - 6x \geq 7$

a. $-1 \leq x \leq 7$ b. $x \leq -1$ or $x \geq 7$

c. $x \leq -7$ or $x \geq 1$ d. $x \leq -1$ and $x \geq 7$

24. Solve $\frac{x}{x-2} \geq 2$

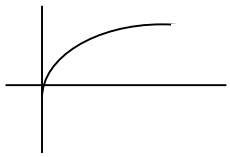
a. $2 \leq x \leq 4$ b. $x \leq 2$ or $x \geq 4$

c. $-2 < x < 2$ d. $2 < x \leq 4$

25. A boat can travel 48 miles downstream in the same time that it takes to travel 20 miles upstream. If the current is 14 mph, what is the boat's speed in calm water?

a. 18 mph b. 54 mph c. 34 mph d.5.7 mph

26. Refer to the graph of $f(x) = \sqrt{x}$ below to determine which answer below is true



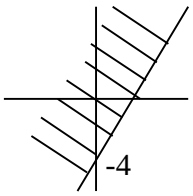
a. f(3) > f(9) b. f(3) = f(-3)

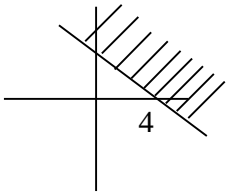
c. f(3) = f(9) d. f(9) > f(3)

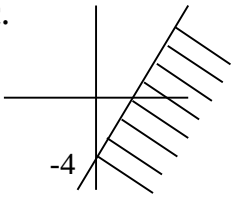
27. Solve $\log_7 x + \log_7(x + 6) = 1$

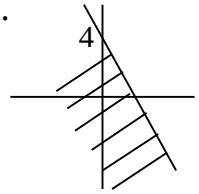
a. 1 b. -7 c. 1 and -7 d. -1 and 7

28. Which graph is the solution of $5x - 2y \leq 8$?

a.


b.


c.


d.


29. A professional painter can paint a room twice as fast as an ametuer. The two working together can paint a particular room in 2 hours. How long would it take the professional to paint the room alone?

a. 2.5 hrs b. 6 hrs c. 4 hrs d. 3 hrs

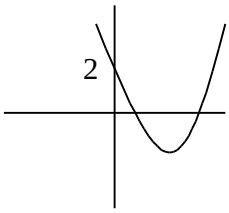
30. How many liters of a 6% acid solution must be added to 12 liters of a 10% acid solution to make a 9% acid solution?

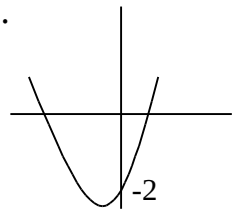
a. 3 b. 6 c. 4 d. 5

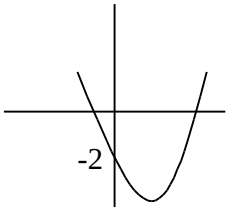
31. Solve $\log_b \sqrt{\frac{63}{21}}$ assuming $\log_b 3 = .62$

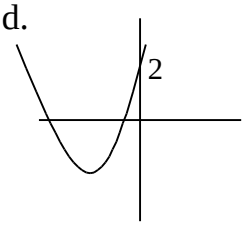
a. 1.86 b. .31 c. $\sqrt{1.86}$ d. .206

32. Which is the graph of $f(x) = x^2 + 4x - 2$?

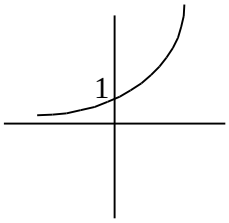
a.


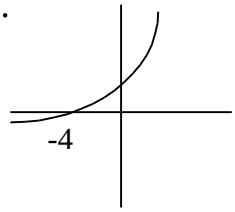
b.


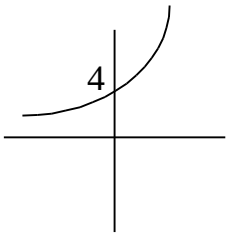
c.


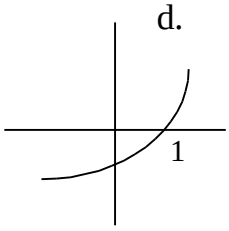
d.


33. Which is the graph of $y = 4^x$?

a.


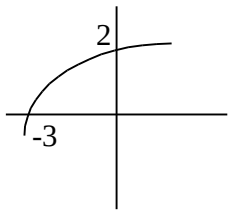
b.


c.


d.


34. Find f(0) for the graph below.

a. -3 b. 0
c. 2 d. can't tell



35. Simplify $\dfrac{6x^3 - 13x^2 + 18x - 1}{3x - 2}$

a. $2x^2 - 3x + 8 + \dfrac{15}{3x - 2}$ b. $2x^2 - 3x - 4 - \dfrac{7}{3x - 2}$

c. $2x^2 - 3x - 8 - \dfrac{15}{3x - 2}$ d. $2x^2 - 3x + 4 + \dfrac{7}{3x - 2}$

Answers

1. c	2. a	3. b	4. d	5. d	6. b	7. d	8. b	9. d
10. b	11. d	12. c	13. a	14. d	15. b	16. b	17. b	18. c
19. a	20. b	21. d	22. a	23. b	24. d	25. c	26. d	27. a
28. a	29. d	30. c	31. b	32. b	33. a	34. c	35. d	

Solutions

1. $2^{1/3}x^{5/3}64^{1/4}x^{2/4}$ convert to exponent form. Use $64=2^6$:

   $2^{1/3}(2^6)^{1/4}x^{5/3}x^{1/2}$ simplify and add exponents:

   $2^{\frac{1}{3}+\frac{3}{2}}x^{\frac{5}{3}+\frac{1}{2}} = 2^{\frac{11}{6}}x^{\frac{13}{6}}$ convert back to radical form and simplify:

   $\sqrt[6]{2^{11}x^{13}} = 2x^2\sqrt[6]{2^5x} = 2x^2\sqrt[6]{32x}$

2. $36\left[-\frac{1}{2}(2x-3)+\frac{x}{3}\right] = 36\left[\frac{3}{4}(x-1)+\frac{1}{9}\right]$ multiplythrough by 36:

   -18(2x - 3) + 12x = 27(x - 1) + 4

   -36x + 54 + 12x = 27x - 27 + 4

   51x = 77

   $x = 77/51$

3. $x^{a^2-b^2}x^{-a^2}x^{-ab+b^2}$ using the rule: $(x^a)^b = x^{a\times b}$

   $x^{a^2-b^2-a^2-ab+b^2} = x^{-ab}$ using the rule: $x^a x^b = x^{a+b}$

4. $\frac{(-3x^2y)^6}{(6x^3y^2)^4} = \frac{(-3)^6x^{12}y^6}{6^4x^{12}y^8} = \frac{3^6}{2^4 3^4 y^2} = \frac{9}{16y^2}$

5. $2x^2 + 3 = x$ multiply through by x^2

   $2x^2 - x + 3 = 0$ set to 0 and factor

   (2x - 3)(x + 1) = 0 possible solutions are: x = 3/2 or x = -1

   Check possible solutions by plugging into original equation:

   $2+\frac{3}{(3/2)^2} = \frac{1}{3/2}$ $\frac{10}{3} \neq \frac{2}{3}$ x = 3/2 is NOT a solution

   x = -1 is ok, so the answer is x = -1

6. $x^4 - 81 = (x^2)^2 - 9^2$ use the formula: $a^2 - b^2 = (a + b)(a - b)$

   $(x^2 - 9)(x^2 + 9) = (x - 3)(x + 3)(x^2 + 9)$

7. $(5 - 4t)(3 + 5t) = 15 + 25t - 12t - 20t^2 = -20t^2 + 13t + 15$

8. $\dfrac{8}{(a-4)(a+4)} + \dfrac{-1}{a-4} = \dfrac{a}{a+4}$, factor denominators to find LCM

8 - (a+4) = a(a-4) multiply through by LCM

$a^2 - 3a - 4 = 0$ expand, set equal to 0, and factor

(a + 1)(a - 4) = 0 possible solutions are: x = -1 or x = 4

x = -1 works in the original equation, but x = 4 gives a 0 denominator

Therefore, x = -1 is the answer

9. y = 0 for the x intercepts:

$0 = x^2 - 3x + 4$ since this won't factor, use the quadratic formula

$\dfrac{-(-3) \pm \sqrt{(-3)^2 - (4)(1)(4)}}{(2)(1)} = \dfrac{3 \pm \sqrt{-7}}{2}$ note a negative in the radical

So, no real solutions NO intercepts

10. $4^{2x-1} = 32$ isolate the term with the exponent

use $4 = 2^2$ and $32 = 2^5$ to get a common base:

$(2^2)^{2x-1} = 2^5$ $2^{4x-2} = 2^5$

4x - 2 = 5 since bases are equal the exponents must be equal

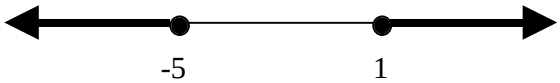
x = 7/4

11. $\dfrac{(3-2i)(4+3i)}{(4-3i)(4+3i)} = \dfrac{12+9i-8i-6i^2}{16-9i^2} = \dfrac{12+i+6}{16+9} = \dfrac{18+i}{25}$

12. -6 ≥ 2x + 4 ≥ 6, remove absolute bars and include ± 6

-10 ≥ 2x ≥ 2, subtract 2 from all sides

-5 ≥ x ≥ 1, divide thru by 2



graphs don't overlap, use OR

x ≤ -5 OR x ≥ 1

13. Replace x with 2p - 1:

$f(2p - 1) = 3(2p - 1)^2 - 5(2p - 1) + 1$ expand and simplify:

$f(2p - 1) = 12p^2 - 22p + 9$

14. If 2 is a root, then f(2) = 0

$12(2)^2 - 3(2)p = 0$ plug in 2 and solve for p

p = 8

15. $x^2 - 3x - 2 = 0$, multiply and set equal to 0

$$x = \frac{3 \pm \sqrt{9 - 4(1)(-2)}}{2(1)}$$ use the quadratic formula

$$x = \frac{3 \pm \sqrt{17}}{2}$$

16. $x^2 + 4x + \mathbf{4} + y^2 - 6y + \mathbf{9} = 3 + \mathbf{4} + \mathbf{9}$, complete the square for x and y

$(x + 2)^2 + (y - 3)^2 = 4^2$

$(x - a)^2 + (y - b)^2 = r^2$ is a circle with c = (a,b) and radius = r

c = (-2,3), r=4 where c is the center and r is the radius

17. $$\frac{\sqrt{2}(3+\sqrt{2})}{(3-\sqrt{2})(3+\sqrt{2})} = \frac{3\sqrt{2}+2}{9-2} = \frac{3\sqrt{2}+2}{7}$$

18. $$\frac{g(x)}{f(x)}(-1) = \frac{g(-1)}{f(-1)} = \frac{2(-1)+7}{(-1)^2-1} = \frac{5}{0}$$ undefined

19. $3x - 9 \geq 0$ because the number under the radical can't be negative

$3x \geq 9$

$x \geq 3$

20. $x + 1 = x^2 - 2x + 1$, square both sides

$0 = x^2 - 3x$, set equal to 0

$0 = x(x - 3)$, factor

0 and 3

21. $\sqrt{5x-1} = 4 - \sqrt{x+3}$ isolate a radical term. Square both sides:

$5x - 1 = 16 - 8\sqrt{x+3} + x + 3$ simplify and isolate the radical term

$x - 5 = -2\sqrt{x+3}$ square both sides:

$x^2 - 10x + 25 = 4x + 12$ set equal to 0 and factor

$x^2 - 14x + 13 = 0 \quad (x-13)(x-1) = 0$

Check answers x = 13 and x = 1 in the original equation:

$\sqrt{65-1} + \sqrt{13+3} = 4 \quad \sqrt{64} + \sqrt{16} = 4 \quad 8 + 4 \neq 4$ 13 doesn't work

$\sqrt{5-1} + \sqrt{1+3} = 4 \quad \sqrt{4} + \sqrt{4} = 4 \quad 2 + 2 = 4$ 1 is OK

22. 2x + y = 4
8x + 5y = 4 multiply both by their LCMs

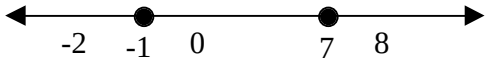
8x + 4y = 16 multiply the first equation by 4
<u>8x + 5y = 4</u> subtract the two equations:
-y = 12 y = 12

2x + 12 = 4 plug 12 into one of the equations and solve for x
x = 8 (8,-12) is the answer

23. $x^2 - 6x - 7 \geq 0$ set to 0

Solve $x^2 - 6x - 7 = 0$ for critical points

x = -1 and x = 7 are the critical points



Choose test points in the 3 regions around the critical points:
-2, 0, and 8 will be used (see graph above)

$(-2)^2 - 6(-2) - 7 \geq 0 \quad 9 \geq 0$ True $\quad x \leq -1$ is a solution

$(0)^2 - 6(0) - 7 \geq 0 \quad -7 \geq 0$ False $\quad$ mid region not a solution

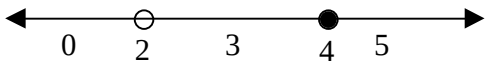
$(8)^2 - 6(8) - 7 \geq 0 \quad 9 \geq 0 \quad x \geq 7$ is a solution

Since the regions are seperate use OR:

$x \leq -1$ or $x \geq 7$

24. $\frac{x}{x-2} - 2 \geq 0$ $\quad \frac{-x+4}{x-2} \geq 0$ set to 0 and simplify

critical points are x = 4 or x = 2 (note: x cannot equal 2)



Test points 0, 3, and 5 will be used

Test points 0 and 5 make the original equation false but
3 makes the equation true so the mid region is the solution
$2 < x \leq 4$

25. use the equation: distance = (rate)(time) or d = rt

Downstream, r = speed of boat + speed of current
48 = (x + 14)t where x represents the speed of the boat

Upstream, r = speed of boat - speed of current
20 = (x - 14)t
t = 20/(x - 14) solve for t and plug into first equation

48 = (x + 14) 20/(x - 14) solve for x
x = 34

26. f(9) = $\sqrt{9}$=3 and f(3) = $\sqrt{3} \approx 1.4$ so f(9) > f(3)

27. $\log_7 x(x + 6) = 1$ use log a + log b = log ab to write as one log

$7^1 = x(x + 6)$ convert from log to exponent form
$x^2 + 6x - 7 = 0$ set to 0 and solve by factoring
(x + 7)(x - 1) = 0 possible answers are x = -7 or 1
For $\log_b a$ a cannot be negative, so x cannot be -7
x = 1 only

28. 5x - 2y = 8 change ≤ to = , set equal to y , and graph:

$y = \frac{5}{2}x - 4$ slope is 5/2 , y intercept is -4

only answers a and c are possible. Plug on (0,0) in the original. If true shade the side with (0,0). If false shade the other:

$5(0) - 2(0) \leq 8$ $\quad 0 \leq 8$ True, so shade the side with (0,0)

answer is a

29. If a pro takes x hrs then an amatuer takes 2x hrs (twice as long).
Pro's rate = 1/x and Amatuer's rate = $1/2x$
Use: 1job = time(pro rate + amatuer rate)
1 = 2(1/x + $1/2x$) solve for x
x = 3

30.

acid1	+	acid2	=	mixture	
x liters		12 liters		(x+12) liters	
.06		.10		.09	set up a table

.06x + .10(12) = .09(x + 12) set up equation from table
6x + 10(12) = 9(x + 12) multiply by 100 to clear decimals
x = 4

31. $\log_b \sqrt{3}$ reduce the fraction under the radical sign
$\log_b 3^{1/2}$ change from radical to exponent form
(1/2) $\log_b 3$ rewrite using: $\log_b a^c = c \log_b a$
(1/2) .62 = .31 sub in .62 for $\log_b 3$ and simplify

32. This is the equation of a parabola that opens up, since all answers are possible try looking at x and y intercepts.
y intercept: plug in 0 for x y = f(0) = -2 only b & c are possible
x intercepts: plug in 0 for y and solve for x
$0 = x^2 + 4x - 2$ use the quadratic formula to find x values
$x = -2 \pm \sqrt{6} \approx -2 \pm 2.45$ x ≈ -4.45 or .45
b is the answer

33. 4^x can never equal 0 so the graph cannot cross the x axis
a & c are the only possible answers. To find the correct one, check the y intercept (when x = 0).
$y = 4^0 = 1$ graph crosses the y axis at 1

34. f(0) is the point where x = 0. But x = 0 is the y axis, so the answer is c since the graph crosses the y axis at 2

35. use long division:

$$
\begin{array}{r|l}
 & 2x^2 \\
\hline
3x-2 & 6x^3 - 13x^2 + 18x - 1 \\
 & \underline{6x^3 - 4x^2} \\
 & \quad\ \ \underline{- \qquad +} \\
 & \qquad\quad -9x^2 + 18x
\end{array}
$$

use $2x^2$ since $(3x)(2x^2) = 6x^3$
multiply $2x^2$ and $3x - 2$
change signs and add
bring down next term (18x)

$$
\begin{array}{r|l}
 & 2x^2 - 3x \\
\hline
3x-2 & 6x^3 - 13x^2 + 18x - 1 \\
 & \underline{6x^3 - 4x^2} \\
 & \qquad\quad -9x^2 + 18x \\
 & \qquad\quad \underline{-9x^2 + 6x} \\
 & \qquad\qquad\quad \underline{+ \qquad -} \\
 & \qquad\qquad\qquad 12x - 1
\end{array}
$$

use $-3x$ since $(3x)(-3x) = -9x^2$
multiply $-3x$ and $3x - 2$
change signs and add
bring down next term (-1)

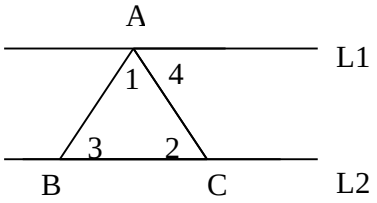
$$
\begin{array}{r|l}
 & 2x^2 - 3x + 4 \\
\hline
3x-2 & 6x^3 - 13x^2 + 18x - 1 \\
 & \underline{6x^3 - 4x^2} \\
 & \qquad\quad -9x^2 + 18x \\
 & \qquad\quad \underline{-9x^2 + 6x} \\
 & \qquad\qquad\quad 12x - 1 \\
 & \qquad\qquad\quad \underline{12x - 8} \\
 & \qquad\qquad\qquad\quad 7
\end{array}
$$

use 4 since $(3x)(4) = 12x$
multiply 4 and $3x - 2$
change signs and add

answer: $2x^2 - 3x + 4 + \dfrac{7}{3x-2}$

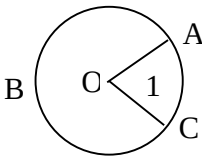
Geometry Practice Problems

1. Δ ABC is an isosceles triangle with base BC. L1 and L2 are parallel. 1=80°. Find 4.



   a. 80° b. 50°
   c. 45° d. 60°

2. In the figure, the measure of arc ABC is 7 π/ 4 and O is the center. of the circle. Find 1.



   a. 30° b. 50°
   c. 40° d. 45°

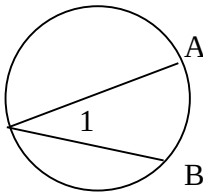
3. Find the area of an equilateral triangle with a sides of length 12.

   a. $72\sqrt{2}$ b. 72 c. $36\sqrt{3}$ d. 36

4. Find the area of a circle inscribed in a square with sides of length 8 cm.

   a. $4\pi\,cm^2$ b. $2\pi\,cm^2$ c. $16\pi\,cm^2$ d. $8\pi\,cm^2$

5. In the figure, 1=40°. Find Arc AB.



   a. 60°
   b. 40°
   c. 20°
   d. 80°

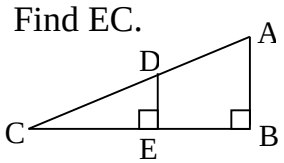
6. Find the length of one of the equal sides of an isosceles triangle with a perimeter 105 if the base is one-third the length of one of the equal sides.

   a. 45 b. 15 c. 35 d. 25

7. An 8 ft by 10 ft garden is surrounded by a 2 ft walkway. Find the area of thewalkway?

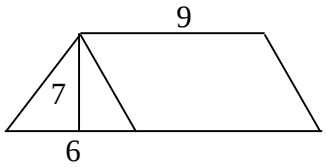
   a. 160 ft^2 b. 82 ft^2 c. 158 ft^2 d. 88 ft^2

8. In the figure, AB=12, DE=9, and BE=4. Find EC.



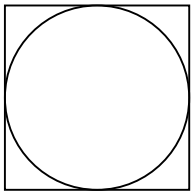
a. 12 b. 16
c. 13 d. 21

9. Find the volume of a tent with length 9 ft, height 7 ft, and a 6 foot base.



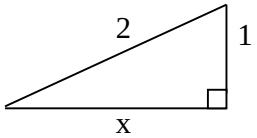
a. 567 ft^3 b. 189 ft^3
c. 94.5 ft^3 d. 162 ft^3

10. The circle in the figure has a circumference of 10π inches. What is the area of the square circumscribed about the circle?



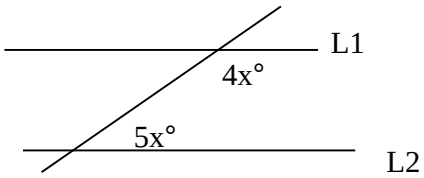
a. 25 in^2 b. 50 in^2 c. 100 in^2 d. 25π in^2

11. For the right triangle in the figure, find x.



a. 5 b. $\sqrt{5}$
c. $\sqrt{3}$ d. 3

12. In the figure L1 and L2 are parellel. Find x.

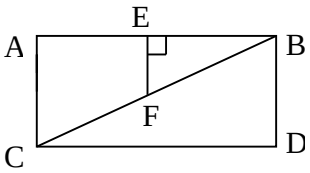


a. 18° b. 10°
c. 9° d. 20°

13. $2\pi/3$ radians is how many degrees?

a. 60° b. 90° c. 120° d. 180°

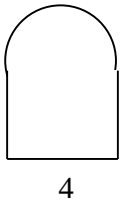
14. In the figure, BC is a diagonal of rectangle ABCD. EF is perpendicular to AB and DCB=35°. Find EFB.



a. 35° b. 45°
c. 55° d. 65°

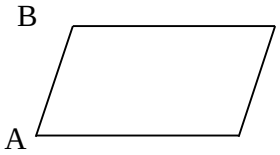
15. The object in the figure has a square base with sides of length 4 and a semicircular top. Find the perimeter of the object.

a. $16+2\pi$ b. $12+2\pi$
c. $16+4\pi$ d. 32



16. For the parallelogram in the figure A=50°. Find B.

a. 180° b. 50°
c. 130° d. 40°

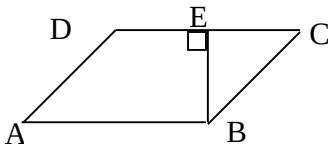


17. Express 45° in radians.

a. $\pi/8$ b. $\pi/4$ c. $\pi/2$ d. π

18. In the figure, parallelgram ABCD has an area of 48. If BC = 5 and BE = 4, what is the perimeter of parallelogram ABCD?

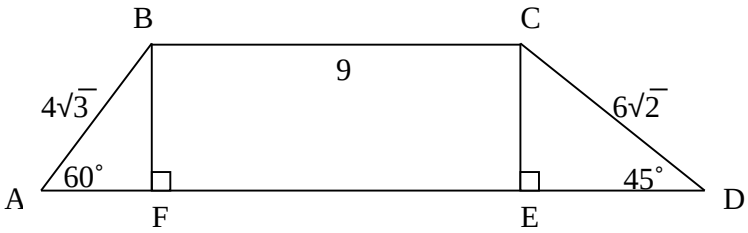
a. 26 b. 32
c. 34 d. 36



19. The volume of a right cylinder is 300 in^3. If the radius is doubled, what will the new volume be?

a. 900 in^3 b. 2400 in^3 c. 600 in^3 d. 1200 in^3

20. Find the area of trapezoid ABCD in the figure below.

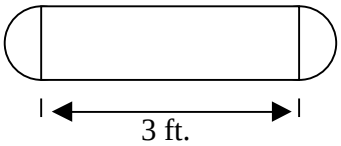


a. 90 b. $11\sqrt{2}+2$ c. $72+6\sqrt{3}$ d. 84

21. Find the volume of the tank in the diagram below.
where the domes are hemispheres with diameter 6 inches.

a. $63\pi \text{ in}^3$ b. $396\pi \text{ in}^3$

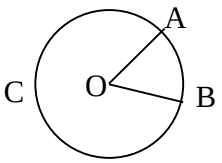
c. $360\pi \text{ in}^3$ d. $1544\pi \text{ in}^3$



22. Find the arclength of arc AB if O is the center, the measure of arc ACB is 300°, and the radius of the circle is 10.

a. 60 b. 60π

c. $10\pi/3$ d. $50\pi/3$



23. If ΔABC and Δabc are similar triangles with AC=20, BC=16, bc=12, B=70°, and c=60°, find A and ac.

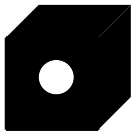
a. A=50°, ac=10 b. A=60°, ac=16

c. A=70°, ac=18 d. A=50°, ac=15

24. What is the volume of material left if a hole with a radius of 1 is drilled through a solid cube with sides of 4? (see drawing)

a. $64 - 16\pi$ b. $12 - 16\pi$

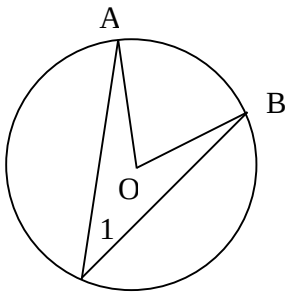
c. $16 - 4\pi$ d. $64 - 4\pi$



25. In the figure below, the length of arc AB is π inches, the radius of the circle is 3 inches, and O is the center. Find the measure of 1.

a. 30° b. 20°

c. 40° d. 60°



Answers

1. b	2. d	3. c	4. c	5. d	6. a	7. d	8. a	9. b
10. c	11. c	12. d	13. c	14. c	15. b	16. c	17. b	18. c
19. d	20. c	21. c	22. c	23. d	24. d	25. a		

Solutions

1. 2+ 3 = 180° – 1 = 180° - 80˚ = 100˚
   ΔABC isosceles, so 2 = 3, therefore 2 = 50˚
   Since L1 and L2 are parellel, 2 = 4
   4 = 50°

2. arc AC = 2π - 7π/4 = π/4 = 180˚/4 = 45˚
   Since 1 is a central angle, 1 = arc AC
   1 = 45°

3. An altitude from a vertex to an opposite side bisects the side.
   Use the **Pythagorean** formula to find the height
   $h^2 + 6^2 = 12^2$
   $h = 6\sqrt{3}$
   Area = $\frac{1}{2}(base)(height) = \frac{1}{2}(12)(6\sqrt{3}) = 36\sqrt{3}$

4. d = side of the square = 8 cm, but d is also the diameter of the circle
   r = (1/2) d = 4 cm, where r is the radius of the circle
   Area of the circle = $\pi r^2 = \pi(4\text{ cm})^2 = 16\pi\text{ cm}^2$

5. 1 is an inscribed angle.
   Arc length = twice the measure of the inscribed angle.
   Arc AB = 2 1; Arc AB = 2 (40°) = 80°

6. If the base = x then the equal sides = 3x
   Perimeter = 105
   105 = x + 3x + 3x = 7x
   x = 15, so equal sides = (3)(15) = 45

7. Area of garden = (8 ft)(10 ft) = 80 ft^2
   The garden + walkway together have width 8 ft + 2 ft + 2 ft = 12 ft
   The garden + walkway together have length 10 ft + 2 ft + 2 ft = 14 ft
   Area of garden + walkway together = (12 ft)(14 ft) = 168 ft^2
   Area of walkway = 168 ft^2 – 80 ft^2 = 88 ft^2

8. ΔABC and ΔDEC are similar, so the ratios of corresponding sides are equal

$$\frac{AB}{DE} = \frac{BC}{EC}$$

Let CE = x, then $\frac{12}{9} = \frac{4+x}{x}$

Cross multiply and solve for x: x = 12

9. Volume = (area of base) (height)

The base is a triangle with base 6 ft and height 7 ft

Area of base = (1/2)(7 ft)(6 ft) = 21 ft^2

Volume = (21 ft^2)(9 ft) = 189 ft^3

10. Circumference = πd, where d is the diameter

10π in = π d

d = 10 in, this is also the length of the side of the square

Area of a square = $side^2$ = $(10\text{ in})^2$ = 100 in^2

11. For right trangles $a^2 + b^2 = c^2$, where c is the hypotenuse

$x^2 + 1^2 = 2^2$

$x^2 = 4 - 1$

$x = \sqrt{3}$

12. L_1 and L_2 are parellel so the angles are supplemental.

$4x + 5x = 180°$

$x = 20°$

13. Use the fact that π radians equals 180°:

2(180°)/3 = 120°

14. $\overline{AC}$ and $\overline{BD}$ are parellel so DCB = EBF

DCB = 35˚ so EBF = 35˚

EFB = 180˚ - 90˚ - 35˚ = 55˚

15. Perimeter of base = 4 + 4 + 4 = 12

Perimeter of Semicircle: C = (1/2) π d

d = 4 because of the base.

C = (1/2) π 4 = 2 π

Total perimeter = 12 + 2π

16. Adjacent andles in a parallelogram are supplemental

$B + A = 180^\circ$

$B + 50^\circ = 180^\circ$

$B = 130^\circ$

17. Use the fact that 180° equals π radians:

$180^\circ/\pi = 45^\circ/x$

$x = 45^\circ\pi/180^\circ$

$x = \pi/4$

18. Area parallelogram = (base) (height)

48 = 4(base)

12= base

Perimeter = 12 + 5 + 12 + 5 = 34

19. $V = \pi r^2 h$, where v is volume of a right cylinder, r is radius, and h is the height.

When r is doubled, r^2 is replaced by $(2r)^2 = 4r^2$

This increases the original volume by **4**

$(300 \text{ in}^3)(4) = 1200 \text{ in}^3$

20. ΔCDE is a 45˚-45˚-90˚ so $ED = \frac{6\sqrt{2}}{\sqrt{2}} = 6$

CE = ED, so CE = 6

ΔABF is a 30˚-60˚-90˚ so $AF = \frac{4\sqrt{3}}{2} = 2\sqrt{3}$

Area = (1/2) (CE) (BC + AD)

Area = $(1/2)(6)(9 + 2\sqrt{3} + 9 + 6) = 72 + 6\sqrt{3}$

21. $V_{tank} = V_{domes} + V_{cylinder}$, but two domes = sphere, so

$V_{tank} = V_{sphere} + V_{cylinder}$

$V_{tank} = \frac{4}{3}\pi r^3 + \pi r^2 h$ where r is 3 inches and h is 36 inches

$V_{tank} = \frac{4}{3}\pi \times 3^3 + \pi 3^3 \times 36 = 360\pi$

22. arc measure AB = 360° - arc measure ACB = 360° - 300° = 60°

AOB = 60°, central angle equals the measure of the intercepted arc

$$arclen = \frac{AOB}{360} 2\pi r = \frac{60}{360} 2\pi \times 10 = \frac{10}{3}\pi$$

23. Since the triangles are similar, all corresponding angles are equal and corresponding sides are proportional. So,

C = c = 60°

A = 180° - B - C = 180° - 70° - 60° = 50°

$$\frac{AC}{ac} = \frac{BC}{bc} \qquad \frac{20}{ac} = \frac{16}{12} \qquad ac = 15$$

24. $V = V_{cube} - V_{cylinder}$

$V = side^3 - \pi r^2 h = 4^3 - \pi 1^2 \text{ x } 4 = 64 - 4\pi$

25. $arclenAB = \frac{AOB}{360°} 2\pi r \qquad \pi = \frac{AOB}{360°} 2\pi 3$, solve for AOB

AOB = 360° / 6 = 60°

1 = (1/2) AOB = (1/2) 60° = 30°

Trigonometry Practice Problems

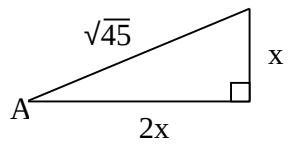
1. cos (x - π/2) = ?

   a. -cos x b. sin x c. cos x d. -sin x

2. If $\sin b = 3/5$ and $\pi/2 \le b \le \pi$, then find $\tan b$.

   a. $4/3$ b. $3/4$ c. $-3/4$ d. $4/5$

3. Find cos A in the figure below.



   a. $2\sqrt{5}/5$ b. $1/2$ c. $3\sqrt{5}/2$ d. 2

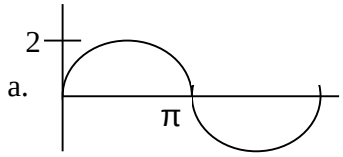
4. If $\sin b = -5/13$ and $\pi \le b \le 3\pi/2$, then $\cos b$.

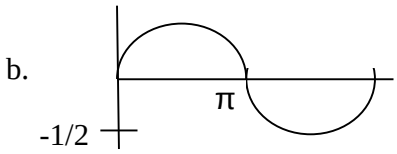
   a. $5/11$ b. $12/13$ c. $-11/13$ d. $-12/13$

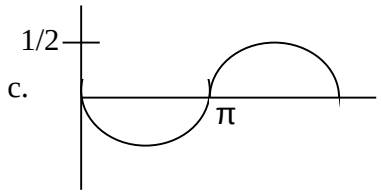
5. π / 6 is is equal to how many degrees?

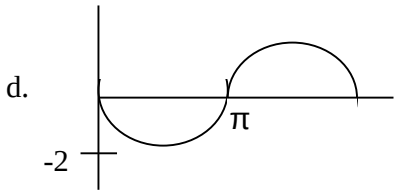
   a. 30° b. 60° c. 90° d. .52˚

6. Which graph best represents the function: y = -(1/2) sin x ?

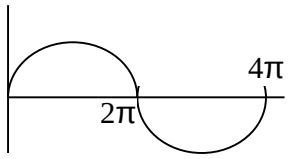


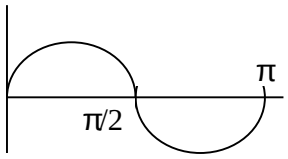


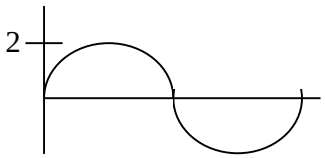


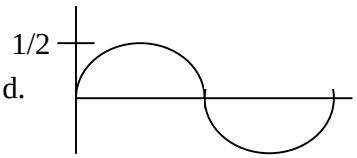


7. Which graph best represents the function: $y = \sin 2x$?

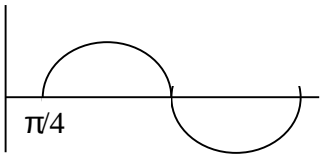
a.


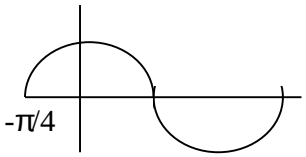
b.


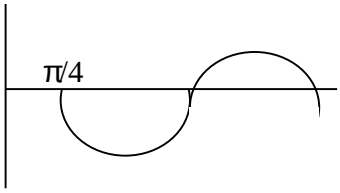
c.


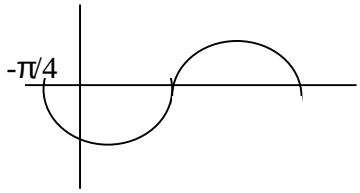
d.


8. Which graph best represents the function: $y = \sin (x - \pi/4)$?

a.


b.


c.


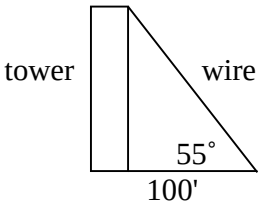
c.


9. On the unit circle (0 to 2π radians), at what radian(s) does sin = -1?

a. π only
b. π/2 and 3π/2
c. 3π/2 only
d. π/4 and 3π/4

10. At 100 feet from the base of a tower, a wire runs at a 55˚ angle to the top of the tower (see figure). If the sin 55˚≈ .8192, cos 55˚≈.5736, and tan 55˚≈1.4281, find the height of the tower. Round answer to the nearest tenth of a foot.

a. tower ≈ 81.9 ft
b. tower ≈ 57.4 ft
c. tower ≈ 142.8 ft
d. tower ≈ 174.3 ft



11. If cos b = .5 and b = 60˚, then arc cos .5 = ?

a. 60˚
b. 30˚
c. .5˚
d. 120˚

12. On the unit circle (0° to 360°) if tan x = 1, then x = ?

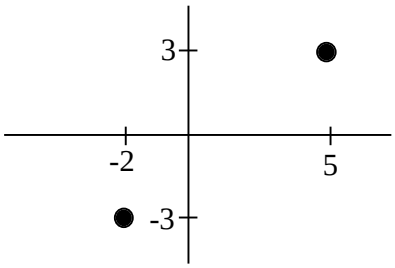
a. 45° only b. 45° and 225°

c. 135° only d. 135° and 315°

13. Find the distance between points a and b on the rectangular coordinate system shown below.

a. 7 b. $\sqrt{13}$

c. 6 d. $\sqrt{85}$



14. For x = 0° to x = 360°, inclusive, how many times does sin x = 0?

a. 1 b. 2 c. 3 d. 4

15. Use the fact that sin 60° = $\sqrt{3}/2$ and cos 60° = $1/2$ to find the value of sin 120°.

a. $\sqrt{3}$ b. $3/4$ c. $\sqrt{3}/2$ d. $\sqrt{3}/4$

16. 270° is how many radians?

a. $\frac{3\pi}{2}$ b. $\frac{\pi}{270}$ c. 270π d. $\frac{4\pi}{3}$

17. What is the supplement of 78°21' ?

a. 11°39' b. 12°21' c. 102°21' d. 101°39'

Answers

1. b 2. c 3. a 4. d 5. a 6. c 7. b 8. a 9. c

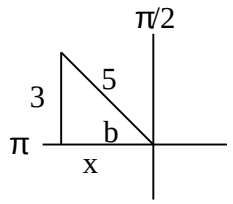
10. c 11. a 12. b 13. d 14. c 15. c 16. a 17. d

Solutions

1. use the identity: $\cos(x-a) = \cos x \cos a + \sin x \sin a$

   $\cos(x - \pi/2) = \cos x \cos(\pi/2) + \sin x \sin(\pi/2)$

   since $\cos(\pi/2) = 0$ and $\sin(\pi/2) = 1$, $\cos(x - \pi/2) = \sin x$

2. 

   sin b = (opposite side) / hypotenuse = 3/5
   use Pythagorean formula to find x
   x = -4 since this is Quadrant II
   tan b = (opposite side) / (adjacent side) = 3 / (-4)

3. Use the Pythagorean formula to find the missing sides:

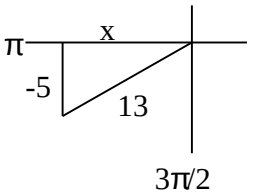
   $\sqrt{45}^2 = (2x)^2 + x^2$

   $45 = 4x^2 + x^2 = 5x^2$

   $x = 3$

   cos A = (adjacent side) / hypotenuse

   $\cos A = 2x/\sqrt{45} = 6/\sqrt{45} = 6\sqrt{45}/45 = 18\sqrt{5}/45 = 2\sqrt{5}/5$

4. 

   sin b = (opposite side) / hypotenuse = -5/13
   use Pythagorean formula to find x
   x = -12 since this is Quadrant II
   cos b = (adjacent side) / hypotenuse = -12/13

5. Since $\pi = 180^\circ$, $\pi / 6 = 180^\circ / 6 = 30^\circ$

6. -1/2 is the **amplitude**. Amplitude affects the range of y values.
   For this function, y can go from -1/2 to +1/2.
   Also, the negative sign flips the graph about the x axis. Since the graph of sin is positive from 0 to π, this graph will be negative between values.

7. The sin ranges from +1 to -1. Since the amplitude was not changed (see problem 6 above), answers c and d are out.
   2 is the period. Period inversely affects when the pattern of the graph repeats. Since the sin function normally repeats at 2π, this function will repeat at $(2\pi) / 2 = \pi$, so b is the correct graph

8. The function sin a has a period from a = 0 to a = 2π. Since this sin function has (x - π/4) for a, it will have a period from x - π/4 = 0 to x - π/4 = 2π, or, x = π/4 to x = 9π/4. This means that the graph is the normal sin function shifted to the right π/4 units on the x axis.

9. $\sin 3\pi/2 = -1$

10. For the tower use: tan 55˚ = tower / 100

    (100)(tan 55˚) = tower
    (100)(1.4281) ≈ tower
    142.8 ≈ tower

11. If cos b = .5 then arc cos .5 = b
    Since b = 60˚ then arc cos .5 = 60˚

12. tan = ±1 at 45° angles and tan is positive in quadrants I and III, so x = 45° (quad I) or 45 + 180° = 225° (quad III)

13. Use the formula for the distance between two points:

    $d = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$, for points (x_1,y_1), (x_2,y_2), and distance d

    $d = \sqrt{(5 - -2)^2 + (3 - -3)^2} = \sqrt{7^2 + 6^2} = \sqrt{49 + 36} = \sqrt{85}$

14. sin 0° = 0, sin 180° = 0, and sin 360° = 0

15. Use the fact that sin 120° = sin 2(60°) and the identity:
    sin 2a = 2 sin a cos a
    sin 2(60°) = 2 sin 60° cos 60° = $2(\sqrt{3}/2)(1/2) = \sqrt{3}/2$

16. Use the fact that 180° = π radians and set up a proportion:

    $$\frac{270°}{x} = \frac{180°}{\pi} \qquad x = \frac{270\pi}{180} \qquad x = \frac{3\pi}{2}$$

17. Supplements add to 180°, so:
    180° = 78°21' + x
    180° - 78°21' = x
    To subtract, borrow 1 degree which is equal to 60 minutes(‘):

    $$\begin{array}{r} 179°\ 60' \\ -78°\ 21' \\ \hline 101°39' \end{array}$$