Tier 1 Practice Test Questions

Whole Numbers

1. A scientist invents a car that can travel for many hours without stopping for fuel. The car travels around a track at 54 miles an hour for 24 hours. At the end of the 24 hours, how far has the car traveled?
    a. 78 miles
    b. 1,286 miles
    c. 1,080 miles
    d. 1,296 miles

2. Constance wants brand new carpet for her square shaped bedroom. Her bedroom is 11 ft. by 11 ft. How much carpeting will Constance need to purchase to cover half of the floor?
    a. 121 sq. ft.
    b. 60.5 sq. ft.
    c. 120 sq. ft.
    d. 65 sq. ft.

Fractions

3. A statue 8 3/5 in. high rests on a stand that is 1 6/10 in. high. What is the total height of statue with the stand? Simplify your answer.
    a. 10—
    b. 7 –
    c. 9 —
    d. 10–

4. A piece of ribbon is $1\frac{7}{8}$ feet long. If the ribbon is going to be divided into 15 pieces, how long will each piece be?
    a. 1/8
    b. 8
    c. –
    d. 13 –

(Test continued on next page)

Ratios, Rates and Proportions

6. Tim can decorate 3 T-shirts in 20 minutes. How many T-shirts can he decorate in 180 minutes?
    a. 1/3
    b. 27
    c. 60
    d. 1200

7. The following prices for pecans are all in proportion except,
    a. $2 per oz equals $6 per 3 oz.
    b. $4 per 2 oz equals $20 per 10 oz.
    c. $9 per 4.5 oz equals $36 per 18 oz.
    d. $13 per 6 oz equals $29 per 12 oz.

Percent

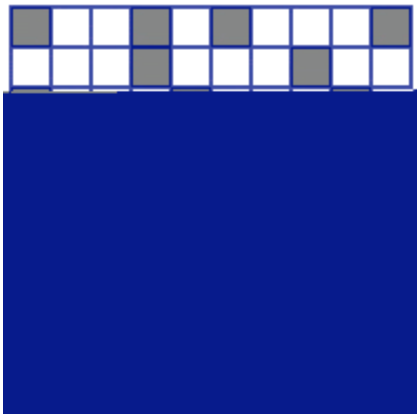


Figure 4

8. In the figure 4 above, what is the percent of unshaded blocks?
    a. 60%
    b. 65%
    c. 70%
    d. 75%

9. What is the discount price for a pair of shoes that cost $ 75.00, if the discount is 25%?
    a. $55.00
    b. $56.25
    c. $57.50
    d. $58.00

(Test continued on next page)

Figure 6

13. ¢KŜ ₮λƎdzℕŜ c l·ō2ØŜ ăK2ø ă l· ŘλƎλűl·f ăŎl·fŜ l·yŘ űKŜ øŜλƎKű 2₮ a ăφ w2ōŜℕă2yΩă ƎℕI·yŘă2yΣ w2Yˆλ̊yˇ, in kg. How many pounds is Romiin? (Round to the nearest whole number)
    a. 125 lbs.
    b. 126 lbs.
    c. 127 lbs.
    d. 128 lbs.

Geometry

Figure 6

14. The circumference of a circle is given by the formula, The radius of the tire of a Lexus is 17 inches. Find the circumference of the tire using 3.14 for . Round your final answer to the nearest whole number.
    a. 104 inches
    b. 105 inches
    c. 106 inches
    d. 107 inches

(Test continued on next page)

21. Simplify the expression. .

a. -9
b. 9
c. 10
d. -10

22. Simplify the expression. — –) ς –.

a. 1/9
b. 7/9
c. -8/9
d. -2/6

23. Write in expanded notation and evaluate.

a. 216
b. 18
c. -216
d. -18

(End of Tier 1 test)

Tier 1 Answers and Explanations

12. ANSWER: c

The two bottles must be in the same metric units. Convert 200ml to liters. Using Figure 5 above, this gives 0.2 L. Therefore, to find the difference, subtract, 0.2 from 3 and get, 2.8 L.

13. ANSWER: a

Converting 56.8Kg to pounds, multiplying by 2.2, (1 kg = 2.2 pounds), therefore, Romiin weighs 124.96 pounds. Rounding to the nearest whole number, the answer is 125 lbs.

Geometry

14. ANSWER: d

The diameter of the tire is 2 times the radius, which would be 34 inches. Using the formula above, C = 3.14 x 34 results in 106.76 in. Rounding 106.76 to the nearest whole number gives 107. So, the circumference of the Lexus tire is 107 inches.

15. ANSWER: c

To find the missing side, b, use the Pythagorean theorem formula, Replace a and c in the formula, with their respective values. Therefore,

6. Which equation matches the information: ?
   a. 2(G) = H
   b. G x H = 2
   c. H (2) = G
   d. 2 + G = H

7. Maria can jump twice as high as Ji-ho. If Maria jumps 3 feet, how high does Ji-ho jump?
   a. 1.5 feet
   b. 6 feet
   c. 5 feet
   d. 1 foot

8. Given $h \quad 28 \quad 28$, the graph of the solution set will have _____ circle? (Fill in the blank).
   a. a closed
   b. an open

Graphing

9. What is the domain for the following set of points?
   (1,2), (4,6), (8, 10), (12, 14)
   a. {2, 6, 10, 14}
   b. {1, 4, 8, 12}
   c. {1, 6, 8, 14}
   d. {2, 4, 6, 8}

(Test continued on next page)

10. In Figure 10, which quadrant is the rectangle in?
    a. I
    b. II
    c. III
    d. IV

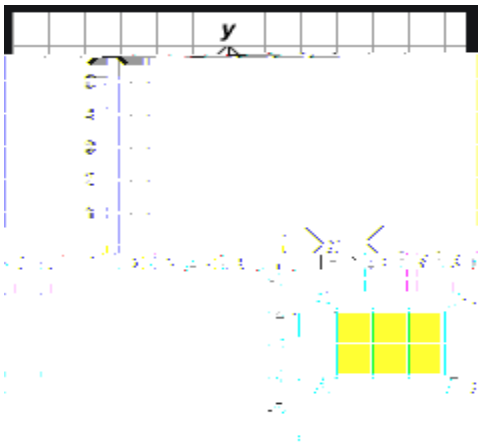


Figure 10

11. In what quadrant will you find the ordered pair (-13, -5)?

    a. I
    b. II
    c. III
    d. IV

(Test continued on next page)

12. Which of the graphs below represents a linear equation?

13. What is the simplified slope of the line in Figure 11?
    a. Slope is 8/10
    b. Slope is 10/8
    c. Slope is 4/5
    d. Slope is 5/4

Figure 11

14. The slope-intercept formula, $y \quad mx \quad b$

15. What can be said about the graphs of the lines $y \quad 7x \quad 9$ and $y \quad 7x \quad 5$?
    a. The lines are skew
    b. The lines are parallel
    c. The lines are perpendicular
    d. None of the above

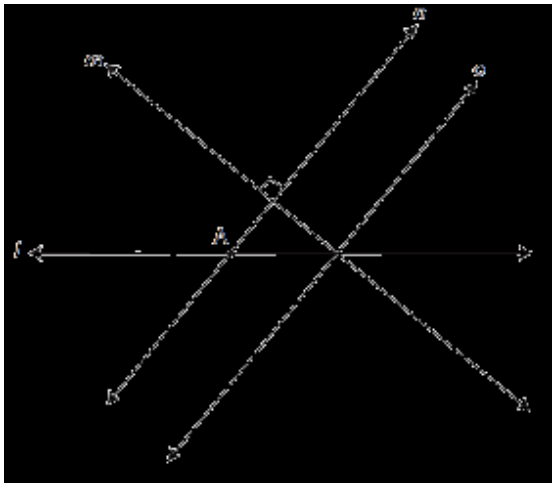
16. What is the slope of the line in Figure 13?
    a. undefined
    b. -2
    c. 2
    d. 0

Figure 13

(Test continued on next page)

17. In the graph below, assuming lines n and o are parallel, which two lines are perpendicular?

a. Lines m and o
b. Lines n and o
c. Lines l and m
d. Lines m and A



Exponents and Polynomials

18. Given the polynomial expression $6x^4 \quad 5x \quad 1$, the constant term is:
    a. 5x
    b. 1
    c. $6x^4$
    d. x

19. Add $7x^7 \quad 5x^4 \quad 4x \quad 8 \quad 11x^7 \quad 10x^5 \quad 2x^4 \quad 4x \quad 9$.

    a. $4x^7 \quad 10x^5 \quad 7x^4 \quad 17$
    b. $4x^7 \quad 10x^5 \quad 7x^4 \quad 17$
    c.
    d.

(Test continued on next page)

20. Consider the rectangle with sides of $x \quad 3$ and $4x \quad 7$. Find the area in terms of x.

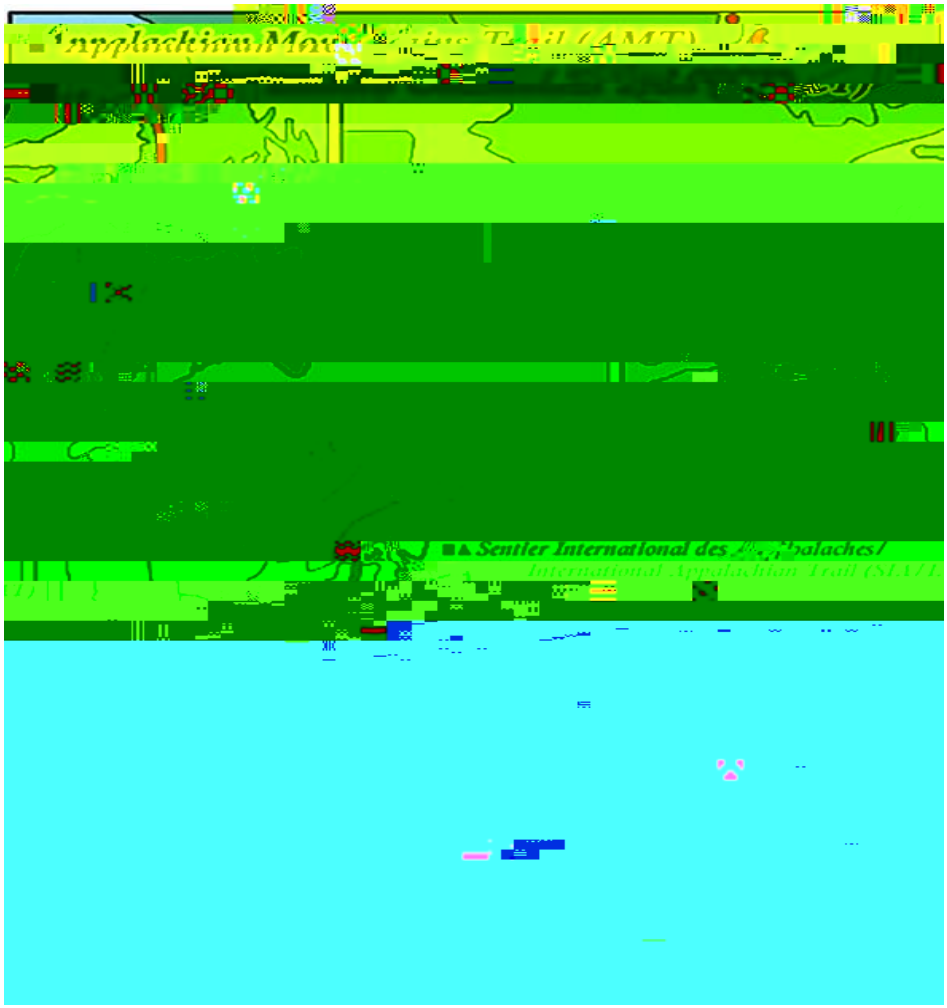
a. $5x^2 \quad 4$
b. $4x^2 \quad 21$
c. $4x^2 \quad 5x \quad 21$
d. $4x^2 \quad 5x \quad 21$

Statistics

22. Using Figure 15, how many modes are there for the length of the top U.S. top hiking trails?

a. 0
b. 1
c. 2
d. 3

Figure 15



(End of Tier 2 test)

8. ANSWER: b Isolate the variable by adding 28 to both sides. h 56. The graph of the inequality
øλtf ōŜ 2LJŜy˘ăλyŎŜ ŭKŜ λyŜljdzl·fλŭè YŜl·yã ά ἑϕ

9. ANSWER: b The numbers are 1, 4, 8, and 12. These are all the x coordinates, which represents the domain of x.

10. ANSWER: d The quadrants are counted countercloc

18. ANSWER: b The constant term in this polynomial expression is 1 since it is the only term without a variable. The other terms are variable terms, and the numbers in front of the variables are

4. Find the factor that $5y^2 \quad 33y \quad 14$ and have in common.

a. $2y \quad 1$
b. $5y \quad 12$
c. $5y \quad 2$
d. $y \quad 7$

Rational Expressions and Equations

7. Divide and simplify. $\frac{x^2 \quad 3x \quad 28}{x \quad 11} \quad \frac{x^2 \quad x \quad 56}{x \quad 11}$

a. $\frac{2x \quad 86}{x \quad 11}$

b. $\frac{1}{x \quad 11^{\ 2}}$

c. $\frac{x \quad 4}{x \quad 8}$

d. $\frac{1}{2}$

8. Simplify and express the result in simplest form.

$\frac{8y}{3x} \quad \frac{6y^2}{x^2} \quad \frac{10y^3}{3}$

a. $\frac{2xy \quad 4x \quad 3y \quad 5xy}{3}$

b. $\frac{\qquad\qquad 2 \quad 2}{\qquad 2}$

c. $\frac{12y^2}{5x}$

d. $2\frac{2}{3} \quad \frac{y}{x} \quad 6 \quad \frac{y^2}{x^2} \quad 3\frac{1}{3} \quad y^3$

9. Solve for x: $\frac{2 \quad x}{10} \quad \frac{x}{5}$

a. $x \quad 1$

b.

c. $x \quad \frac{1}{2}$

d. $x \quad 0$

10. The time it takes to travel a particular distance varies inversely as the speed traveled. If it takes a person 15 hours to travel from point A to point B at a speed of 60 miles per hour, how long will it take to travel from point A to point B at 75 miles per hour?

a. 12 hours
b. 30 hours
c. 10 hours
d. 18.75 hours

Radical Expressions and Equations and Quadratic Formula

11. The formula for the volume of a sphere is , where V is the volume and r is the radius of the sphere. Solve the formula for r.

a. $r \quad \frac{V}{4}$

b. $r \quad \frac{4}{V}$

c. $r \quad \sqrt[3]{V \quad \frac{4}{3}}$

d. $r \quad \sqrt[3]{\frac{3V}{4}}$

(Test continued on next page)

12. John and his little brother Kevin have a job that requires them to rake and bag leaves at a large house in their neighborhood. Suppose it takes John 2 hours to do the job alone and Kevin 3 hours to do the job alone. At these rates, how long will it take both boys to complete the job together?

a. 5 hours
b. 1.25 hours
c. 1 hour
d. 1.2 hours

13. Simplify: $\sqrt{x^4y^6z^9}$, z 0

a. $x^2 y^3 z^4 \sqrt{z}$

b $2x \quad 3y \quad 4\frac{1}{2}z$

c. $x^2 |y^3| z^4 \sqrt{z}$

d. $x^8 y^{12} z^{18}$

14. Simplify: $\sqrt{3b} \quad 5\sqrt{3b} \quad \sqrt{12b^7}$, b 0

a. $15b \quad 6b^4$

b. $3b^3 \sqrt{3b}$

c. $6b \quad 15b^2$

d. $3b^2 \quad \sqrt{3b}$

(Test continued on next page)

15. Simplify: $\sqrt[3]{54b^8c^9}$

a. $3b^2c^3\sqrt[3]{2b^2}$

b.

c. $162b^{24}c^{27}$

d. $18b^2c^3\sqrt[3]{b^2}$

16. Rationalize the denominator and simplify the result. $\dfrac{6\quad\sqrt{10}}{\sqrt{5}}$

a.

b. $\sqrt{}$

c. $6\quad\sqrt{2}$

d. $\sqrt{}\qquad\sqrt{}$

17. Solve for x: $4\sqrt{11\quad x}\quad 15\quad 3$

a. $x\quad\sqrt{13}$

b. $x\quad 2$

c. $x\quad 2$

d. $x\quad 13$

(Test continued on next page)

18. Solve for x using the Quadratic Formula: $5x^2 \quad 2 \quad 12x$

a. $6 \quad \sqrt{46}$ or $6 \quad \sqrt{46}$

b. $\frac{6}{5} \quad \frac{\sqrt{46}}{5}$ or $\frac{6}{5} \quad \frac{\sqrt{46}}{5}$

c. $\frac{2}{5}$ or $\frac{2}{5}$

d. $\frac{5}{12}$ or $\frac{5}{12}$

19. Use the discriminant to determine the number and type of solutions to the following quadratic equation.

$7x^2 \quad 3x \quad 1 \quad 0$

a. one real solution

b. two real solutions

c. no solutions

d. two complex solutions

(Test continued on next page)

Functions

20. What are the domain and range of the following function?

a. Domain: 8 , 0 , 2
Range: 5 ,7 , 9 , 15 , 19

b. Domain: 5 , 7 , 9 , 15 , 19
Range: 8 ,0 , 2

c. Domain: 5 , 7 , 9 , 15 , 19
Range: 8 , 8 , 0 , 2 , 2

d. Domain: 5 , 7 , 9 , 11 , 13
Range: 8 , 4 , 2 , 0 , 2

21. What are the domain and range of the function $\sqrt{}$

a. Domain: x 0
Range: f(x) 0

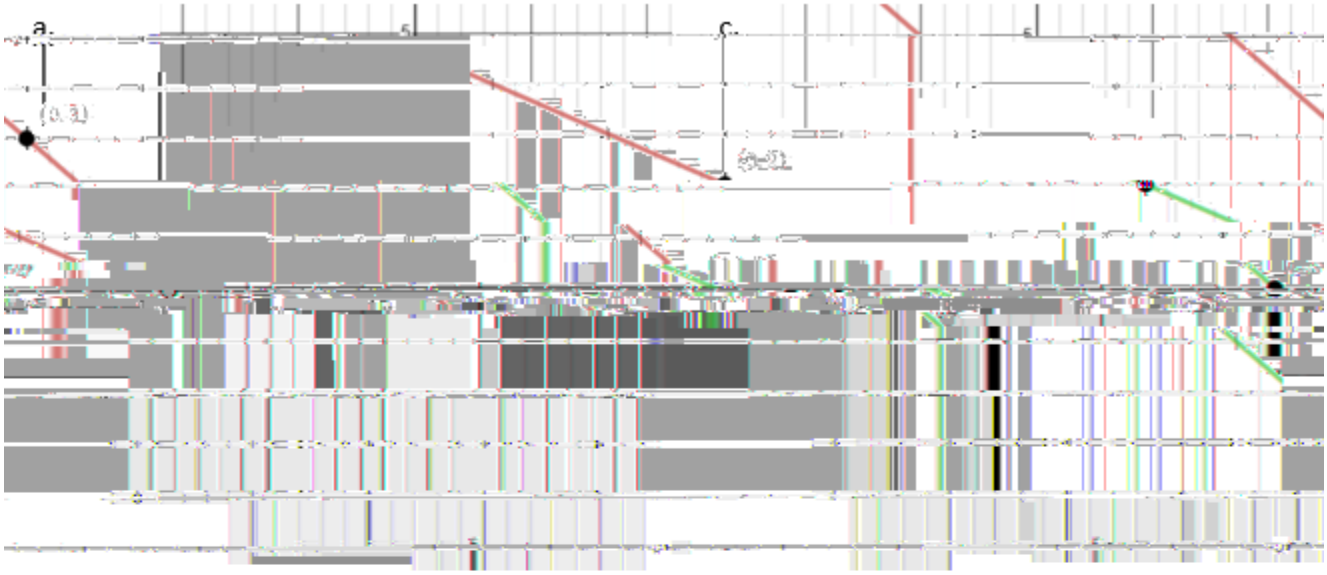
b. Domain: x 0

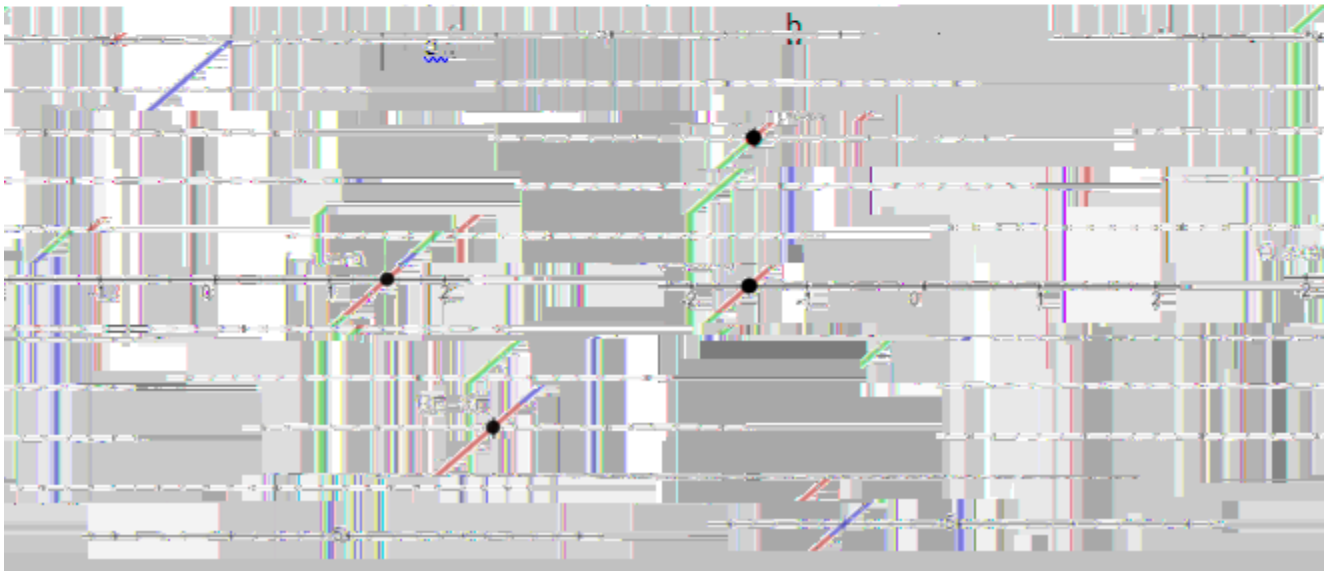
c. Domain: x 0
Range: f(x) 0

d. Domain: All real numbers
Range: All real numbers

(Test continued on next page)

22. Graph: $f(x) = -2x + 3$





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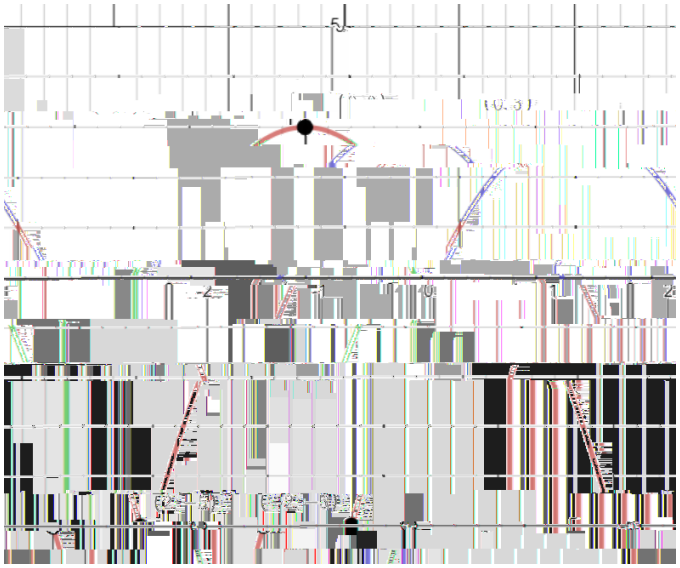
23. Which of the functions below is represented by the following graph?



a. $f(x) = 5x^2 \quad 3$

b. $f(x) = -2x^2 \quad 3$

c. $f(x) = -5x^2 \quad 3$

d. $f(x) = 2x^2 \quad 3$

24. Which function below has a graph that passes through all 4 of these points:

$0,1 \quad , \quad 1,0 \quad , \quad 2, \ 1 \quad , \quad 7,2$

a. $f(x) = \ x \quad 1\ ^2$

b. $f(x) = x \quad 1$

c. $f(x) = \sqrt[3]{x \quad 1}$

d. $f(x) = \frac{1}{2}x \quad 1$

(Test continued on next page)

25. Given that $f(x) = 10x \quad 3$, find $f(x \quad 3)$.

a. $f(x \quad 3) \quad 10x \quad 33$

b. $f(x \quad 3) \quad 33$

c. $f(x \quad 3) \quad 10x \quad 6$

Tier 3 Answers and Explanations

1. ANSWER: d

L multiply last terms $7 \quad 7 \quad 49$

Gathering terms and simplifying, you get $9x^2 \quad 21x \quad 21x \quad 49$

4. ANSWER: c

For this problem, both $5y^2 \quad 33y \quad 14$ and need to be completely factored. Here are their factorizations:

$5y^2 \quad 33y \quad 14 \quad 5y \quad 2 \quad y \quad 7$

The factor that both polynomials have in common is $5y \quad 2$.

5. ANSWER: d

The given equation, $x^2 \quad 17x \quad 50 \quad 20$, is a quadratic equation. One means to solve a quadratic equation is by writing it in standard form
$(ax^2 \quad bx \quad c \quad 0)$ and then attempting to factor the trinomial on the left of the equal sign.

For the given equation, standard form is $x^2 \quad 17x \quad 70 \quad 0$. Note that 20 was added to both sides of the original equation.

The trinomial to the left of the equals sign does indeed factor. So, in factored form, the equation becomes $x \quad 7 \quad x \quad 10 \quad 0$.

Setting both factors equal to zero and solving for x, you will get
$x \quad 10$ or $x \quad 7$.

So, now the general form of the inverse variation equation is

$$t \quad \frac{900}{v}$$

To find how long it will take to travel from point A to point B at 75 miles per hour, just substitute 75 for v in the general equation:

$$t \quad \frac{900}{75}$$

$$t \quad 12$$

It will take 12 hours to travel from point A to B at a speed of 75 miles per hour.

$$\frac{3V}{4} \quad r^3$$

$$\sqrt[3]{\frac{3V}{4}} \quad \sqrt[3]{r^3}$$

$$r \quad \sqrt[3]{\frac{3V}{4}}$$

12. ANSWER: d

¢KŜℕŜΩă Y˜2ℕŜ űKl·y˜2yŜ ø l·è ű2 űKλy˥ l·ō2ʤzű ŦλyŘλy∃ l· ă2ftʤzűλ2y˜ű2 űKλă LJℕ2ōfŜY˜Σ ōʤzű KŜℕŜΩă 2yŜ l·LJLJℕ2l·ŎKY

Summarizing the information given in the problem, it takes John 2 hours to do the job alone, and it takes Kevin 3 hours to do the job alone.

This means that John could do 3 jobs in 6 hours and Kevin could do 2 jobs in 6 hours. In other words, together they could do 5 jobs in 6 hours. Using this rate to calculate the number of hours per job, you get

$$\frac{6 \text{ hours}}{5 \text{ jobs}} \quad 1.2 \text{ hours per job}.$$

13. ANSWER: c

Simplifying the radical expression, $\sqrt{x^4y^6z^9}$, $z \quad 0$, requires writing the radicand (part under the radical) in terms of perfect squares since the radical is a square root. Here is the radical simplified with perfect squares:

$$\sqrt{x^4y^6z^9}$$

$$\sqrt{x^{2\ \ 2}\ y^{3\ \ 2}\ z^{4\ \ 2}z}$$

The factors highlighted in red are perfect squares, which means that when the square root is taken, the result will be the portion inside parentheses. So further simplifying, you will get

$$\sqrt{x^{2\ \ 2}\ \ y^{3\ \ 2}\ \ z^{4\ \ 2}\ z}$$

$$x^2 y^3 z^4 \sqrt{z}$$

¢Kλă l·LJLJŜl·Nă űƨ ōŜ űKŜ ăƨfdzűλƨyΣ ōdzű λű λăyΩűΦ ¸ƨdz ØŜNŜ űƨfŘ l·ű űKŜ ōŜƎλyŸλyƎ ƨŦ űKŜ LJNƨōfŜY űKl·ű z 0 , but you were not told anything about the variables x or y. In fact, they could be negative numbers. If y, in particular, is negative then the above solution is incorrect.

{ƨΣ ăλyŎŜ ØŜ Řƨyűű ĵyƨØ ØKŜűKŜN è λă yŜƎl·űλØŜ ƨN LJƨăλűλØŜΣ űKŜ ŎƨNNŜŎű ăƨfdzűλƨyΣλă

$$x^2 \left|y^3\right| z^4 \sqrt{z}\,.$$

Check the YouTube video below for a detailed explanation of why absolute value bars are necessary for the result.

https://www.youtube.com/watch?v=dqek7EkXcYo

14. ANSWER: a

For this problem, since $b \quad 0$, the final result ØƨyΩű NŜljdzλNŜ l·yè l·ōăƨfdzűŜ Øl·fdzŜ ōl·NăΣ l·ă Ø l·ă űKŜ Ŏl·ăŜ λyΣ problem #13. To simplify , distribute and continue simplifying:

$$\sqrt{3b}\ \ 5\sqrt{3b}\ \ \ \sqrt{12b^7}$$

$$5\sqrt{9b^2}\ \ \ \sqrt{36b^8}$$

$$5\ \ 3b\ \ \ 6b^4$$

$$15b\ \ \ 6b^4$$

15. ANSWER: a

To simplify the given radical expression, $\sqrt[3]{54b^8c^9}$, the radicand (expression under the radical symbol) needs to be expressed in terms of perfect cubes, since the radical is a cube root:

$$\sqrt[3]{54b^8c^9}$$

$$\sqrt[3]{3^{\ 3}\ 2\ b^{2\ \ 3}\ b^2\ \ c^{3\ \ 3}}$$

The factors in red are perfect cubes, and once the cube root of these is extracted, the result will be the expression inside the parentheses. So, simplifying further, you have

$$\sqrt{\qquad\qquad\qquad}$$

$$\sqrt{\qquad}$$

Note that since the original radical is a cube root (index is 2ŘŘúΣ úKŜℕŜ ø2yℚú ōŜ I· yŜŜŘ ₮2ℕ I·ōă2ftdzűŜ value bars in the final answer. In short, when the index of a radical is odd (cube roots, 5th roots, etc.), 2ℕ úKŜ ØI·ℕλI·ōfŜă λy˜úKŜ ℕJI·ŘλŎI·yŘ I·ℕŜ I·ff LJ2ăλúλØŜΣ I·ōă2ftdzűŜ ØI·ftdzŜ ōI·ℕă ø2yℚú ōŜ yŜŎŜăăI·ℕè λy˜₮λyl·f ℕŜădztűφ

16. ANSWER: d

To rationalize the denominator in $\dfrac{6\quad\sqrt{10}}{\sqrt{5}}$, means to get rid of the radical in the denominator. This is achieved by multiplying the numerator and denominator of the radical expression by $\sqrt{5}$ and then simplifying:

17. ANSWER: b

To solve for x, isolate the radical expression so that it is alone on one side of the equation:

$$4\sqrt{11 \quad x} \quad 15 \quad 3$$

$$4\sqrt{11 \quad x} \quad 12$$

$$\sqrt{11 \quad x} \quad 3$$

Now, just square both sides of the above equation. This will cancel the square root.

$$x \quad \frac{(\ \ 12) \quad \sqrt{(\ \ 12)^2 \quad 4(5)(\ \ 2)}}{2(5)}$$

$$\frac{12 \quad \sqrt{144 \quad 40}}{10}$$

$$\frac{12 \quad \sqrt{184}}{10}$$

$$\frac{12 \quad 2\sqrt{46}}{10}$$

$$\frac{6 \quad \sqrt{46}}{5}$$

Thus, the solutions are $\frac{6}{5} \quad \frac{\sqrt{46}}{5}$ or $\frac{6}{5} \quad \frac{\sqrt{46}}{5}$.

19. ANSWER: d

To determine the number and type of solutions for $7x^2 \quad 3x \quad 1 \quad 0$, the discriminant will be used. The discriminant is the expression under the radical in the Quadratic Formula: $b^2 \quad 4ac$.

When , the given quadratic equation will have one real solution.

When , the given quadratic equation will have two real solutions.

When $b^2 \quad 4ac \quad 0$, the given quadratic equation will have two complex solutions.

For $7x^2 \quad 3x \quad 1 \quad 0$, $a \quad 7$, $b \quad 3$, $c \quad 1$. Substituting these values into the discriminant gives:

$b^2 \quad 4ac$

$(\quad 3)^2 \quad 4(7)(1)$

$9 \quad 28$

19

This negative result for the value of the discriminant means that $7x^2 \quad 3x \quad 1 \quad 0$ will have two complex (not real) solutions.

20. ANSWER: b

In the function, , the domain is the set of all x-values, and the range is the set of all y-values. For example, in the ordered pair, $5 , \quad 8$, 5 would be in the domain, and -8 would be in the range.

Considering all the ordered pairs in the function, the domain and range are

Domain: $5 , 7 , 9 , 15 , 19$

Range: $8 , 0 , 2$

Note that although -8 and 2 are found in more than one of the ordered pairs, these values should only be included once in the range.

21. ANSWER: c

The domain and range for $\sqrt{}$ can most easily be determined by observing its graph, which looks like the graph below.

23. ANSWER: b

The graph given is in the shape of a parabola (think of a bowl shape) and has a vertex at the point (0,3). Note that this point is also the y-intercept. Due to the graph being a parabola, this means that it was formed from a quadratic equation, which has general form of $f(x) = ax^2 \quad bx \quad c$. In this form, the vertex is given by

$$\frac{b}{2a}, f \quad \frac{b}{2a}$$

. (This vertex formula can be found on the provided formula sheet.)

Also, when the leading coefficient, a, is negative, the parabola turns downwards, which is the case for

Finally, note that the graph passes through the points $2, \quad 5$ and $2, \quad 5$. So, these two points would need to satisfy the equation describing the graph. The only equation where this is true is $f(x) = -2x^2 \quad 3$:

24. ANSWER: C

To find which function passes through all 4 points, you could take each function and substitute each x-value into the function and show that the corresponding y-value is obtained. In short, you would be dzăλy∃ I· LJ№2ŏŜăă 2ŦŜfλYλyl·ŭλ2y⊕ I Ŝ№Ŝ⊗ă øKI·ŭ ŭKλă LJ№ocess looks like for $f(x) = \sqrt[3]{x \quad 1}$:

Recall that the points are $0,1 \quad , \quad 1,0 \quad , \quad 2, \quad 1 \quad , \quad 7,2$.

This shows that all the points satisfy $f(x) = \sqrt[3]{x \quad 1}$. This is not the case for the other functions given.

25. ANSWER: a

Given that $f(x) = 10x \quad 3$, find $f(x \quad 3)$.

The solution is obtained by substituting $x \quad 3$ for x in $f(x) = 10x \quad 3$:

$$f(x \quad 3) = 10(x \quad 3) \quad 3$$

$$10x \quad 30 \quad 3$$

$$10x \quad 33$$