FR1

Final Review

To the Test – be sure to bring:

(1) your personally-prepared 8 ½ " by 11" study guide for this test
(2) your simple, non-graphing calculator
(3) your pencils
(4) your BluGold ID

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1. Add or subtract. Write the answer in lowest terms.

$$\frac{3}{5}+\frac{2}{35}-\frac{5}{14}$$

$14\cdot 5$, $35\cdot 2$, $14\cdot 5$

5 : 5
35 : 5 · 7
14 : 7 · 2
5 · 7 · 2

common denominator
LCD = 70

$$\frac{42}{70}+\frac{4}{70}-\frac{25}{70}$$

$$\frac{46-25}{70}=\frac{21}{70}=\frac{3}{10}$$

Reduce completely

2. Evaluate.

$$2\left[5+2\left(7-4\right)^2\right]-3(2)$$

$2[5+2(3)^2]-3(2)$
$2[5+2\cdot 9]-6$
$2[5+18]-6$
$2[23]-6$
$46-6$
40

P arenthesis
E xponent
M ult or D iv in order they appear
A DD or S ub in order they appear

3. Solve and check the equation for the value of y:

$$54=48y+10-3y-6$$

combine like terms

$54=45y+4$
$-4 \quad -4$

isolate variable term

$\frac{50}{45}=\frac{45y}{45}$

$\frac{50}{45}=y$ simplify

$\frac{10}{9}=y$ isolate variable

$\left\{\frac{10}{9}\right\}$

FR2

4. Solve and check the equation for the value of m:

$$5m-(7m+9)+4=19m+5(1-4m)$$

distribute $5m-7m-9+4=19m+5-20m$

combine like terms $-2m-5=-m+5$

$+2m \quad +2m$

isolate variable terms $-5=m+5$

$-5 \quad -5$

$-10=m$

$\{-10\}$

5. Write the main equation for solving this problem and then solve.

The sum of two consecutive integers is 89. Find the integers.

EQUATION: $x+(x+1)=89$

$2x+1=89$

$-1 \quad -1$

$\frac{2x}{2}=\frac{88}{2}$

$x=44$

$x+1=45$

The integers are 44 and 45.

6. Write the main equation for solving this problem and then solve. You may find using the table helpful.

How many milliliters (mL) of a 12% alcohol solution must be added to 50 mL of a 3% alcohol solution to make a 8% alcohol solution? Express your answer as a mixed number if necessary.

Equation:

$.12x+.03(50)=.08(x+50)$

Remove decimals, multiply by 100

$12x+3(50)=8(x+50)$

$12x+150=8x+400$

$-150 \quad -150$

$12x=8x+250$

$-8x \quad -8x$

$\frac{4x}{4}=\frac{250}{4}$

$x=62.5$

ml	%	solution
x	.12	$.12x$
50	.03	$.03(50)$
$x+50$	.08	$.08(x+50)$

Your answer: Add 62.5 or $62\frac{1}{2}$ mL of the 12% alcohol solution.

FR3

7. Identify a second point on a line that contains the point (-2, 3) and has a slope of $m=\frac{3}{4}$.

point $(-2,3)$ x, y $\quad m = 3/4$ rise, change in y / run, change in x

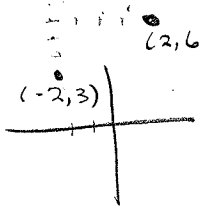
-2 changes by "run" of 4

3 changes by "rise" of 3

$(-2,3)$ $+4$ $+3$

$2, 6$

new point $(2,6)$



8. Given the *standard form* of the equation of a line: $3x+y=6$

Give the *slope-intercept form* of the line and state the y-intercept point.

Graph the line:

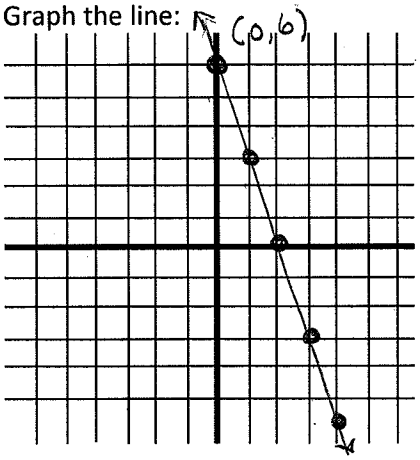
slope intercept $y = mx + b$

$y = -3x + 6$ (slope, $(0,b)$ point)

slope $= \frac{-3}{1}$

slope $= -3$

y-intercept $= (0,6)$



plot point $(0,6)$

then apply the slope down 3, over 1

finally draw the line

9. Identify the equation of the line, if possible, in *slope-intercept form*, given the following information. The line contains (1,0) and (5,-6).

IF neither point is the y-intercept, use point slope formula to get the equation

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{0 - -6}{1 - 5} = \frac{6}{-4} = -3/2$$

pick either point and put it in the point slope $y - y_1 = m(x - x_1)$

use $(1,0)$: $y - 0 = -\frac{3}{2}(x - 1)$

$y = -\frac{3}{2}x + \frac{3}{2}$

use $(5,-6)$: $y - -6 = -\frac{3}{2}(x - 5)$

$y + 6 = -3/2\,x + \frac{15}{2}$

$-6 \quad -6$

$y = -\frac{3}{2}x + \frac{3}{2}$

$\frac{15}{2} - \frac{12}{2} = 3/2$

FR4

10. Let $f(x) = -12x + 7$. Find $f(2)$

$f(2) = -12(2) + 7$

$f(2) = -24 + 7$

$f(2) = -17$

11. Let $f(x) = -\frac{1}{2}x - 3$. Find x so that $f(x) = -1$.

IF $f(x) = -1/2\,x - 3$ and $f(x) = -1$ then $-1/2\,x - 3 = -1$

multiply all terms by 2 to remove the denominator

$-\frac{1}{2}x(2) - 3(2) = -1(2)$

$-x - 6 = -2$

$+6 \quad = +6$

$-x \quad = 4$

$x = -4$ $\{-4\}$

12. Solve the system using the **substitution** method. Be sure to show your work. (Points will be deducted for using the wrong method.)

$x + 3y = -12$

$3x + 4y = -6$

Isolate one variable

$x = -3y - 12$

substitute for x in other equation

$3(-3y - 12) + 4y = -6$

$-9y - 36 + 4y = -6$

$-5y - 36 = -6$

$+36 \quad +36$

$-5y \quad = 30$

$\frac{-5y}{-5} = \frac{30}{-5}$

$y = -6$

replace in first equation

$x + 3(-6) = -12$

$x - 18 = -12$

$+18 \quad +18$

$x = 6$

Solution point: $(x, y) = (6, -6)$

13. Develop the equations you need to solve this problem, list them, and solve the problem. R.J. inherited $20,000 and puts some of it into an account earning 4% simple interest and the rest in an account earning 7% simple interest. He earns a total of $1130 in interest after a year. How much did he deposit into each account?

R.J. invested $ 9000 in the 4% account and $ 11000 in the 7% account.

$	%	int
x	.04	$.04x$
$20000 - x$	.07	$.07(20000 - x)$
20,000		1130

If 20,000 total and some at 4% then $20,000 - x$ will be at 7%

$.04x + .07(20000 - x) = 1130$

multiply the three terms by 100

$4x + 7(20000 - x) = 113000$

$4x + 140000 - 7x = 113000$

$-3x + 140000 = 113000$

$-113000 = -113000$

$-3x + 27000 = 0$

$+3x \quad +3x$

$\frac{27000}{3} = \frac{3x}{3}$

at 4%

$9000 = x$

$20000 - x = 11000$

at 7%

FR5

$-7^2 \neq (-7)^2$ these are different

14. Simplify.

-7^2

$-7 \cdot 7 = -49$

15. Simplify. Assume all variables represent nonzero real numbers. The answer should not contain negative exponents.

apply the exponent to the ( ) first

Example

$(x^2)^3 = x^{2 \cdot 3} = x^6$

$x^2 \cdot x^3 = x^{2+3} = x^5$

Remember

$$\frac{(-4a^3)^2 b^7}{12a^{-9}b^4}$$

$$\frac{(-4)^2 a^{2 \cdot 3} b^7}{12 a^{-9} b^4} = \frac{16 a^6 b^7 a^9}{12 b^4}$$

$$= \frac{4 a^{15} b^3}{3} = \boxed{\frac{4}{3} a^{15} b^3}$$

16. Find the product. $(4m^2)(-5m^4)$

multiply coefficients then bases

$-20 m^{2+4}$ $\boxed{-20 m^6}$

17. Find the product. $(3n+9)^2 = (3n+9)(3n+9)$

$9n^2 + 27n + 27n + 81$

$\boxed{9n^2 + 54n + 81}$

or

	$3n$	$+9$
$3n$	$9n^2$	$+27n$
$+9$	$+27n$	$+81$

18. Find the greatest common factor.

$36wy^6 - 9wy^4 + 18wy^2$

GCF $= 9wy^2$

FR6

19. Factor completely.

$x^2 - 3x - 54$

what two numbers m and n multiply to -54 and add to -3.

$m \cdot n = -54$
$m + n = -3$

$-9, +6$

$(x-9)(x+6)$

factors $(x-9)(x+6)$

20. Factor completely by grouping.

$15c^2 - 40ck - 6ck + 16k^2$

underline 1st two terms and last two terms. Factor out the GCF in the first two. Copy the ( ) to the 2nd two. What should be factored out? Factor out the common ( ).

$5c(3c-8k) \quad -2k(3c-8k)$

$(3c-8k)(5c-2k)$

Final factors

21. If there is more than one answer, separate them with commas.

Solve the equation: $12s^2 + 96s = 0$

factor out the GCF

$12s(s+8) = 0$

use zero property

$\frac{12s}{12} = \frac{0}{12}$ $\quad s + 8 = 0$
$\quad -8 \quad -8$
$\quad s = -8$

$s = 0$

$\{-8, 0\}$

FR7

22. If there is more than one answer, separate them with commas.

Solve the equation: $210w+280=-35w^2$

Set the equation to 0. make sure the 1st term is positive.

$\frac{35w^2}{35}+\frac{210w}{35}+\frac{280}{35}=\frac{0}{35}$ ← Reduce

$w^2+6w+8=0$

Factor

$(w+4)(w+2)=0$

$w+4=0$ $\quad w+2=0$

$-4=-4$ $\quad -2=-2$

$w=-4$ $\quad w=-2$

$\{-4,-2\}$

23. Write the following rational expression in its lowest terms.

$$\frac{8d-2}{28d-7}=\frac{2(4d-1)}{7(4d-1)}=\frac{2}{7}$$

factor first!

24. Multiply. Be sure to simplify your answer.

$$\frac{n^2+12n+27}{n+3}\bullet\frac{9}{n+9}$$

Factor first then reduce.

$$\frac{(n+3)(n+9)}{n+3}\cdot\frac{9}{n+9}=9$$

FR8

25. Find the sum. Simplify if possible.

$$\frac{d^2+67}{(d-4)(d-9)}+\frac{5-17d}{(d-4)(d-9)}$$

Since we have LIKE denominators we can go ahead and add.

Combine ONLY numerators.

$$=\frac{d^2-17d+72}{(d-4)(d-9)}$$

now factor the numerator IF it can be easily factored.

$$=\frac{(d-8)(d-9)}{(d-4)(d-9)}$$

$$=\boxed{\frac{d-8}{d-4}}$$

$\frac{d-8}{d-4}$ will not factor, so we cannot reduce

26. Divide and simplify if possible.

$$\frac{\frac{x^2+8}{3}}{x+\frac{8}{x}}$$

must make into 1 fraction

$$\frac{x}{1}+\frac{8}{x}=\frac{x\cdot x}{x}+\frac{8}{x}$$

$$=\frac{x^2+8}{x}$$

$$\frac{\frac{x^2+8}{3}}{\frac{x^2+8}{x}}=\frac{x^2+8}{3}\cdot\frac{x}{x^2+8}$$

multiply

$$=\boxed{\frac{x}{3}}$$

27. Solve for the value of $5n$:

$$\frac{2n-5}{3}=\frac{11n+24}{8}$$

use means/extremes rule

$$8(2n-5)=3(11n+24)$$

$$16n-40=33n+72$$

-72 $\quad$ -72

$$16n-112=33n$$

$-16n$ $\quad$ $=-16n$

$$-112=17n$$

$$\frac{-112}{17}=\frac{17n}{17}$$

$$\frac{-112}{17}=n$$

But the question asks for $5n$.

Answer $5\left(\frac{-112}{17}\right)$

$$=\boxed{\frac{-560}{17}}$$

FR9

28. Develop the proportion needed to solve this problem. List it and then solve the problem. With a current flowing at 25 mph, a boat can travel 35 mi with the current (down) in the same amount of time it can go 12 mi against the current. Find the speed of the boat in still water. [d = r * t]

$\frac{d}{r} = t$ down stream, up stream

Proportion:

$\frac{d}{r} = \frac{d}{r}$ (boat speed + current) (boat speed − current)

The speed of the boat in still water is approximately _____ mph.

$\frac{35}{B+25} = \frac{12}{B-25}$ (down, up)

$\frac{\text{dist downstream}}{\text{still water speed} + \text{current}} = \frac{\text{distance upstream}}{\text{still water speed} - \text{current}}$

$35(B-25) = 12(B+25)$

$35B - 875 = 12B + 300$

$+875 \quad = \quad +875$

$35B = 12B + 1175$

$-12B \quad -12B$

$\frac{23B}{23} = \frac{1175}{23}$

$B \approx 51.086\ldots$

29. Find the square root, if possible. Express your answer as a simplified, improper fraction, if necessary.

$\sqrt{\frac{16}{169}} = \frac{\sqrt{16}}{\sqrt{169}} = \frac{4}{13}$

reduce inside under the $\sqrt{}$ if possible, then take the square root

Ex: $\sqrt{\frac{12}{3}} = \sqrt{4} = 2$

FR.10

30. Rewrite with a positive exponent and evaluate. Express your answer as a simplified, improper fraction, if necessary.

$512^{-\frac{2}{3}}$

$x^{-a} = \frac{1}{x^a}$ $\quad x^{\frac{a}{b}} = \sqrt[b]{x^a}$

$x^{\frac{a}{b}}$ ← power, ← root

$$\frac{1}{512^{2/3}} = \frac{1}{\sqrt[3]{512}^2} = \frac{1}{8^2} = \boxed{\frac{1}{64}}$$

31. Simplify completely. Assume all variables represent positive real numbers. The answer should contain only positive exponents.

$\frac{1}{x^{-a}} = x^a$ or $x^{-a} = \frac{1}{x^a}$

apply the outside exponent first

$$\left(\frac{2x^{-4}}{3y^6}\right)^{-5} = \frac{2^{-5}x^{20}}{3^{-5}y^{-30}} = \frac{3^5 x^{20} y^{30}}{2^5} = \boxed{\frac{243}{32}x^{20}y^{30}}$$

32. Simplify completely

exponent can be under or outside the radical

$(\sqrt{x})^6\sqrt{x^8}$

$$\sqrt{x^6}\sqrt{x^8} = \sqrt{x^6 x^8} = \sqrt{x^{14}} = x^7$$

think of $x^{\frac{14}{2}} = x^7$

FR 11

33. Perform the indicated operation and simplify. Assume all variables represent positive real numbers.

$\sqrt{3a^6b^7} \cdot \sqrt{21ab^2}$ combine under one $\sqrt{}$

$\sqrt{63a^7b^9}$

factor into perfect squares

$\sqrt{9 \cdot 7 \cdot a^6 \cdot a \cdot b^8 \cdot b} = 3a^3b^4\sqrt{7ab}$

34. Perform the operation and simplify.

$2\sqrt{63} - \sqrt{28} + 3\sqrt{700}$

$2\sqrt{9 \cdot 7} - \sqrt{4 \cdot 7} + 3\sqrt{100 \cdot 7}$

$2 \cdot 3\sqrt{7} - 2\sqrt{7} + 3 \cdot 10\sqrt{7}$

$6\sqrt{7} - 2\sqrt{7} + 30\sqrt{7}$

$34\sqrt{7}$

35. Solve for the value of b using the quadratic equation!!

$(2b-3)^2 = 11$ foil, combine, set to 0

$(2b-3)(2b-3) - 11 = 0$

$4b^2 - 6b - 6b + 9 - 11 = 0$

$4b^2 - 12b - 2 = 0$ reduce by 2

$2b^2 - 6b - 1 = 0$

$a = 2$, $b = -6$, $c = -1$

$b = \dfrac{-(-6) \pm \sqrt{(-6)^2 - 4(2)(-1)}}{2(2)}$

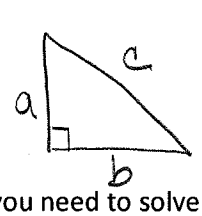
$b = \dfrac{6 \pm \sqrt{36+8}}{4} = \dfrac{6 \pm \sqrt{44}}{4} = \dfrac{6 \pm \sqrt{4 \cdot 11}}{4}$

$= \dfrac{6 \pm 2\sqrt{11}}{4}$

$= \dfrac{2(3 \pm \sqrt{11})}{4}$

$= \dfrac{3 \pm \sqrt{11}}{2}$

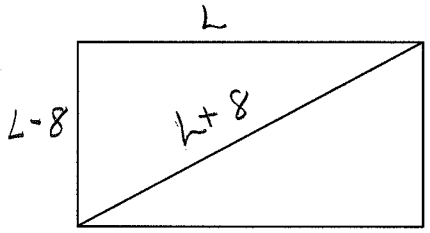
FR 12



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

36. Develop the equation you need to solve this problem, list it, label the picture, and solve the problem.

The height of a wide-screen TV is 8 inches less than its length. The diagonal of the rectangular screen is 8 inches more than the length. Find the **height** of the screen.



Equation:

$L^2+(L-8)^2=(L+8)^2$

Height: 24 inches

$L^2+L^2-16L+64=L^2+16L+64$

$L^2-16L=16L$
$-16L \quad -16L$

$L^2-32L=0$

$L(L-32)=0$

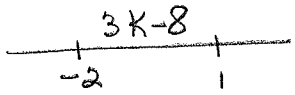
$L=0 \quad L-32=0$
$L=32$

Length = 32

Height = 32 − 8
= 24

37. Write the solution in interval notation:

$-2\le 3k-8\le 1$



$-2\le 3K-8\le 1$

$-2\le 3K-8 \quad +8 \quad +8$

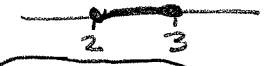
$\frac{6}{3}\le\frac{3K}{3}$

$2\le K$

$3K-8\le 1 \quad +8 \quad +8$

$\frac{3K}{3}\le\frac{9}{3}$

$K\le 3$



$[2,3]$

38. Add or subtract as indicated.

$|-10+4|+3|-8-(-11)|$

$|-6|+3|-8+11|$

$6+3\cdot 3$

$6+9$

15

39. Find the mean, median, and mode for the following set of values.

80, 93, 87, 85, 98, 89, 87, 83

MEAN: sum numbers, divide by number of items

sum = 702
# items = 8

MEAN = 87.75

MEDIAN: MIDDLE number
place values in order

80, 83, 85, 87, 87, 89, 93, 98

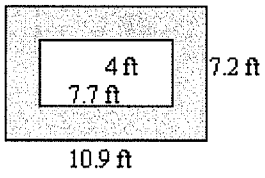
MEDIAN = 87

IF the middle had been between 87 and 88, add then divide by 2 for $87\frac{1}{2}$

MODE: most often

MODE = 87 it occurs the most times.

40. Find the area of the shaded portion:

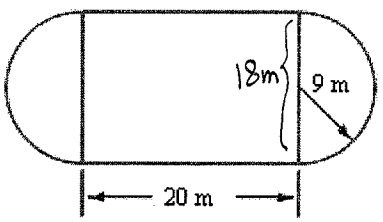


area of large rectangle
(10.9)(7.2) = 78.48 sq ft

area of inside rectangle
(7.7)(4) = 30.8 sq ft

shaded area (subtract the two) = 47.68 sq ft

41. What is the perimeter of this indoor track? What is its surface area?



circumference of circle + 2 sides

circumference of circle
$\pi \cdot d$
$3.14 \cdot 18 = 56.52 + 40 = 96.52$ m
(2 sides)

circle area = πr^2
$= 3.14 \cdot 9^2$
$= 3.14 \cdot 81$
$= 254.34$ sq m

circle area = 254.34 sq m.

rectangle area = 20 · 18 = 360 sq m

Total area = 614.34 sq. meters