

049 $\{5, 2, 1, 5, 9, 13, 17, 21, 25, 29, 37, 47, 51, 59$

*51-12 Perform the indicated ops

$$\textcircled{1} \quad \frac{2}{9} \cdot \frac{3}{4} = \frac{\overset{1}{\cancel{2}}}{\underset{3}{9}} \cdot \frac{\overset{1}{\cancel{3}}}{4} = \boxed{\frac{1}{6}}$$

$$\textcircled{5} \quad \frac{1}{7} \cdot \frac{14}{24} \div \frac{1}{2} = \frac{1}{\cancel{7}} \cdot \frac{\overset{2}{\cancel{14}}}{\underset{12}{24}} \cdot \frac{\overset{1}{\cancel{2}}}{1} = \frac{2}{12} = \boxed{\frac{1}{6}}$$

$$\textcircled{9} \quad \frac{11a^2b}{5ab^2} \cdot \frac{22a^3b^2}{10ab^4} = \frac{11a^2b}{5ab^2} \cdot \frac{10ab^4}{22a^3b^2}$$

$$= \frac{\overset{1}{\cancel{11}} a^2 b}{\underset{1}{5} a b^2} \cdot \frac{\overset{2}{\cancel{10}} a b^4}{\underset{2}{\cancel{22}} a^3 b^2} = a^{2+1-1-3} b^{1+4-2-2}$$

$$= a^{-1} b^1 = \boxed{\frac{b}{a}}$$

~~13~~ #513 - end Same. All answers in lowest terms

$$\textcircled{13} \quad \frac{x^2-9}{x^2-4} \cdot \frac{x-2}{x-3} = \frac{\cancel{(x-3)}(x+3)\cancel{(x-2)}}{\cancel{(x-2)}(x+2)\cancel{(x-3)}} = \boxed{\frac{x+3}{x+2}}$$

$$\textcircled{17} \quad \frac{3x-12}{x^2-4} \cdot \frac{x^2+6x+8}{x-4} = \frac{3\cancel{(x-4)}}{\cancel{(x-2)}(x+2)} \cdot \frac{\cancel{(x+2)}(x+4)}{\cancel{(x-4)}} = \boxed{\frac{3(x+4)}{x-2}}$$

Factoring x^2+6x+8

$$b^2-4ac = 6^2-4(1)(8) = 36-32 = 4$$

$$x = \frac{-6 \pm \sqrt{4}}{2(1)} = \frac{-6 \pm 2}{2} = -3 \pm 1$$

$(x-(-2))(x-(-4))$
 $= (x+2)(x+4)$
 \rightarrow factorization!

099 $\{8, 2, 5, 21, 25, 29, 37, 47, 51, 59\}$

(21) $\frac{1}{x^2-9} \div \frac{1}{x^2+9} = \boxed{\frac{x^2+9}{x^2-9}}$ x^2+9 doesn't factor!
(Not over the rationals)

(25) $\frac{5x+2y}{25x^2-5xy-6y^2} \cdot \frac{20x^2-7xy-3y^2}{4x+y}$

$$25x^2-5xy-6y^2$$

$$a=25, b=5y, c=-6y^2$$

$$b^2-4ac = (5y)^2 - 4(25)(-6y^2)$$

$$= 25y^2 + 600y^2$$

$$= 625y^2 \quad \phi$$

$$\sqrt{625y^2} = 25y^*$$

$$x = \frac{5y \pm 25y}{2(25)} = \frac{5(y \pm 5y)}{5(10)} = \frac{y \pm 5y}{10} \begin{cases} \frac{6y}{10} = \frac{3y}{5} \\ -\frac{4y}{10} = -\frac{2y}{5} \end{cases}$$

$$0^0 \quad 25x^2-5xy-6y^2 = 25\left(x - \frac{3y}{5}\right)\left(x + \frac{2y}{5}\right)$$

$$= 5 \cdot 5 \left(x - \frac{3y}{5}\right)\left(x + \frac{2y}{5}\right) = (5)\left(x - \frac{3y}{5}\right)(5)\left(x + \frac{2y}{5}\right)$$

$$= \boxed{(5x-3y)(5x+2y)}!$$

* $\sqrt{625y^2} = 25|y|$, but I'm overlooking that, so I can factor!

099 \$5.2 #s 25, 29, 37, 47, 51, 59

25 cutid

Factor $20x^2 - 7xy - 3y^2$

AC-method: $(20)(-3) = (2)(2)(5)(-3) = -60$

| | |
|------------------|----------------|
| $-12 + 5 = -7$ | ✓ middle term |
| $(-12)(5) = -60$ | — AC (magic #) |

My "Price is Right" method.

ac = $(20)(-3) = -60$. Now how to hit that number, by making sure the middle term will be -7 :

- $-7 = -8 + 1$ -8 higher!
- $= -9 + 2$ -18 higher!
- $= -10 + 3$ -30 higher!
- $= -15 + 8$ -120 lower!
- $= -12 + 5$ -60 Sweet!

Both tell us to split -7 into

$-12 + 5$!

$$\begin{aligned}
& 20x^2 - 12xy + 5xy - 3y^2 \\
& = 4x(5x - 3y) + y(5x - 3y) \\
& = (5x - 3y)(4x + y) \quad \text{Sweet!}
\end{aligned}$$

So we have
 $\frac{3}{2}$ methods
to choose from
in factoring.
Depends on your
training, which
you'll prefer.

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(25) Factoring Done. Let's look @ what

we have:

$$\frac{5x+2y}{(5x-3y)(5x+2y)}$$

$$\frac{(5x-3y)(4x+y)}{4x+y}$$

= 1
Figures!

$$(29) \frac{4t^2-1}{6t^2+t-2}$$

$$\frac{8t^3+1}{27t^3+8}$$

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

$$\frac{(3t+2)(9t^2-6t+4)}{(2t+1)(4t^2-2t+1)}$$

$$= \boxed{\frac{9t^2-6t+4}{4t^2-2t+1}}$$

Note:

$$8t^3+1 = 2^3t^3+1^3$$

$$= (2t)^3+1^3$$

$$x=2t, y=1 \quad \checkmark$$

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

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(37)

$$6a^2b + 2ab^2 - 20b^3$$

$$4a^2b - 16b^3$$

$$10a^2 - 22ab + 4b^2$$

$$27a^3 - 125b^3$$

$$= \frac{2b(3a^2 + ab - 10b^2)}{4b(a^2 - 4b^2)} \cdot \frac{2(5a^2 - 11ab + 2b^2)}{(3a)^3 - (5b)^3}$$

$$= \frac{3a^2 + ab - 10b^2}{a^2 - 4b^2} \cdot \frac{5a^2 - 11ab + 2b^2}{(3a)^3 - (5b)^3}$$

$$= \frac{(3a - 5b)(a + 2b)}{(a - 2b)(a + 2b)} \cdot \frac{(5a - b)(a - 2b)}{(3a - 5b)(9a^2 + 15ab + 25b^2)}$$

$$= \frac{5a - b}{9a^2 + 15ab + 25b^2}$$

In sum/diff of cubes

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

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

→ This part
NEVER factors!
(Not if we're
keeping it real)

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(47)

$$\frac{xy - 2x + 3y - 6}{xy + 2x - 4y - 8} \cdot \frac{xy + x - 4y - 4}{xy - x + 3y - 3}$$

$$= \frac{x(y-2) + 3(y-2)}{x(y+2) - 4(y+2)} \cdot \frac{x(y+1) - 4(y+1)}{x(y-1) + 3(y-1)}$$

$$= \frac{(y-2)(\cancel{x+3})}{(y+2)(\cancel{x-4})} \cdot \frac{(y+1)(\cancel{x-4})}{(y-1)(\cancel{x+3})} = \boxed{\frac{(y-2)(y+1)}{(y+2)(y-1)}}$$

(51)

$$\frac{2x^3 + 10x^2 - 8x - 40}{x^3 + 4x^2 - 9x - 36} \cdot \frac{x^2 + x - 12}{2x^2 + 14x + 20}$$

$$= \frac{2x^2(x+5) - 8(x+5)}{x^2(x+4) - 9(x+4)} \cdot \frac{(x+4)(x-3)}{2(x^2+7x+10)}$$

$$= \frac{(\cancel{x+5})(2x^2-8)}{(\cancel{x+4})(x^2-9)} \cdot \frac{(\cancel{x+4})(x-3)}{2(\cancel{x+5})(x+2)} = \frac{2(x^2-4)(x-3)}{2(x-3)(x+3)(x+2)}$$

$$= \frac{(x-2)(\cancel{x+2})}{(x+3)(\cancel{x+2})} = \boxed{\frac{x-2}{x+3}}$$

099 § 5.2 #59

$$\textcircled{59} (x^2-25) \cdot \frac{2}{x-5} = \frac{2(x^2-25)}{x-5} = \frac{2(x-5)(x+5)}{x-5}$$

$$\boxed{= 2(x+5)}$$