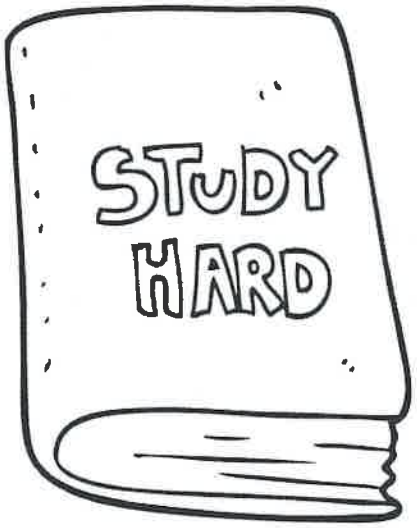
FOM & PRE-CALC 10

Final Exam



BOOK 2:

- REAL NUMBERS, RADICALS & EXPONENTS
- POLYNOMIALS

NAME: KEY BLOCK: _____

Study Checklist

This review booklet is by no means a "practice final". It is a collection of practice questions on each unit, meant to guide your final exam studying and prepare you for the types of questions you will see. DO NOT treat this booklet as a practice test. DO NOT go straight to the answer key when you come across a question you cannot remember how to do. Difficult questions SHOULD guide your study! Always look up a concept in your class notes if you are stuck, then attempt the question again.

BEFORE beginning this booklet you should:

- read through your class notes booklet on *each topic*
- make your own "quick summary page" of important formulas & key concepts for the unit
- review quizzes & tests from the unit to recall strengths & weaknesses *(a great study method would be to re-do old quizzes & tests on a separate piece of paper)*

WHILE working through this booklet you should:

- look up concepts & example problems in your class notes when you come across a problem you are stuck on
- make a list of "questions to ask my teacher" so you can come to class and use your time efficiently.

Questions I'm having difficulty with:

Page	Question Number #	Topic

UNIT 3: REAL NUMBERS, RADICALS & EXPONENTS

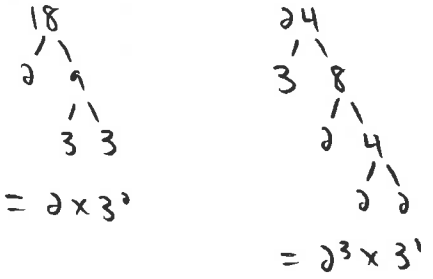
MY NOTES AND THINGS TO REMEMBER...

* OMIT WRITTEN RESPONSE #10 g, h, i, j

UNIT 3: Exponents and Radicals Multiple Choice

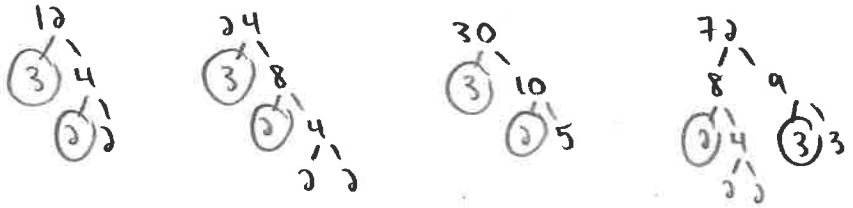
1. What is the least common multiple of 18 and 24?

A. 2×3
B. $2^2\times3^3$
C. $2^3\times3^2$
D. $2^4\times3^3$



2. What is the greatest common factor of 12, 24, 30, 72?

A. 360
B. 12
C. 6
D. 2



3. Express $2\sqrt{5}$ as an entire radical.

A. $\sqrt{10}$
B. $\sqrt{20}$
C. $\sqrt{50}$
D. $\sqrt{100}$

$2\sqrt{5}$
$= \sqrt{4} \times \sqrt{5}$
$= \sqrt{20}$

4. Order the numbers from the smallest value to the largest value.

I.	$-3\sqrt{2}$
II.	$\sqrt{9}$
III.	$2\sqrt{3}$
IV.	$-2\sqrt{7}$

$= -\sqrt{9} \times \sqrt{2} = -\sqrt{18}$ (2)
$= \sqrt{9}$ (3)
$= \sqrt{4} \times \sqrt{3} = \sqrt{12}$ (4)
$= -\sqrt{4} \times \sqrt{7} = -\sqrt{28}$ (1)

A. I, IV, II, III
B. I, IV, III, II
C. IV, I, II, III
D. IV, I, III, II

5. Simplify: $(2x^3)^3 \cdot 3x^4$

A. $24x^{36}$
B. $24x^{13}$
C. $18x^{36}$
D. $6x^{13}$

$= 2^3 x^9 \cdot 3x^4$
$= 8x^9 \cdot 3x^4$
$= 24x^{13}$

6. Which one of the following sets of numbers contains only rational numbers?

A. $\left\{-\frac{3}{4}, 7.1, \sqrt{16}\right\}$

B. $\left\{\frac{1}{2}, -6, \frac{\sqrt{5}}{2}\right\}$ X

C. $\{-3, 4.\overline{23}, 4.121314\ldots\}$ X

D. $\{\sqrt{10}, 3\sqrt{9}, \pi\}$ X

7. Simplify: $\sqrt[3]{1080}$

A. $2\sqrt[3]{135}$

B. $3\sqrt[3]{40}$

C. $6\sqrt[3]{5}$

D. $6\sqrt[3]{30}$

$= \sqrt[3]{27} \times \sqrt[3]{40}$

$= 3 \times \sqrt[3]{40}$

$= 3 \times \sqrt[3]{8} \times \sqrt[3]{5}$

$= 3 \times 2 \times \sqrt[3]{5}$

$= 6\sqrt[3]{5}$

8. Simplify: $(3a^2)^3(4a^{3+0})$ $= 1$

A. $9a^6$

B. $27a^6$

C. $36a^8$

D. $108a^9$

$= 3^3 a^6 (1)$

$= 27a^6$

9. Which expression is equivalent to $\left(-c^2\right)^{-\frac{1}{3}}$?

A. $\frac{1}{\sqrt[3]{-c^2}}$

B. $\frac{1}{\sqrt[3]{c^2}}$

C. $\frac{1}{\sqrt{-c^3}}$

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

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

$= \frac{1}{\sqrt[3]{(-c^2)}}$

10. Simplify: $\sqrt[2]{x^3} \div \sqrt[3]{x^4}$

A. $\sqrt[6]{x}$

B. $\sqrt[8]{x^9}$

C. $\sqrt[9]{x^8}$

D. $\sqrt[12]{x}$

$= x^{\frac{3}{2}} \div x^{\frac{4}{3}}$

$= x^{\frac{3}{2}-\frac{4}{3}}$

$= x^{\frac{9}{6}-\frac{8}{6}}$

$= x^{1/6} = \left(\sqrt[6]{x}\right)^1 = \sqrt[6]{x}$

11. Which of the following statements are true?

I.	$\sqrt{4} = 2$ since $2 \times 2 = 4$ ✓
~~II.~~	$\sqrt{8} = 4$ since $4 + 4 = 8$
III.	$\sqrt[3]{27} = 3$ since $3 \times 3 \times 3 = 27$ ✓
~~IV.~~	$\sqrt[3]{81} = 9$ since $9 \times 9 = 81$

A. I and III only
B. I and IV only
C. II and III only
D. II and IV only

12. Which of the following statements are true?

24
/ \
4 6
/ \ / \
2 2 2 3

I.	The factors of 24 are 2, 3, 4, 6, 8 and 12. ✗ missing 1 & 24
II.	The prime factorization of 24 is $2^3 \times 3^1$. ✓
III.	The prime factors of 24 are 2 and 3. ✓
IV.	$\sqrt{24}$ is an irrational number. ✓

A. I and IV only
B. II and III only
C. II, III and IV only
D. I, II, III and IV

13. Simplify: $\sqrt{72}$

$\sqrt{72} = \sqrt{9} \times \sqrt{8}$
$= 3 \times \sqrt{8}$
$= 3 \times \sqrt{4} \times \sqrt{2}$
$= 3 \times 2 \times \sqrt{2}$
$= 6\sqrt{2}$

A. $2\sqrt{6}$
B. $6\sqrt{2}$
C. $18\sqrt{2}$
D. $36\sqrt{2}$

14. Evaluate: $16^{-\frac{3}{4}}$

$= \frac{1}{16^{3/4}}$
$= \frac{1}{\left(\sqrt[4]{16}\right)^3}$
$= \frac{1}{2^3}$
$= \frac{1}{8}$

A. -8
B. $\frac{1}{8}$
C. $\frac{1}{2}$
D. 2

15. Which pattern could be used to predict 3^{-4} ?

A.

3^3	27
3^2	9
3^1	3
3^0	1
3^{-1}	$\frac{1}{3}$
3^{-2}	$\frac{1}{9}$
3^{-3}	$\frac{1}{27}$

B.

3^3	9
3^2	6
3^1	3
3^0	0
3^{-1}	$-\frac{1}{3}$
3^{-2}	$-\frac{1}{6}$
3^{-3}	$-\frac{1}{9}$

C.

3^3	27
3^2	9
3^1	3
3^0	1
3^{-1}	–3
3^{-2}	–9
3^{-3}	–27

D.

3^3	9
3^2	6
3^1	3
3^0	0
3^{-1}	–3
3^{-2}	–6
3^{-3}	–9

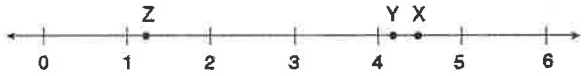
16. Which of the following number lines best represents the placement of X, Y, Z, given:

$X = 2\sqrt{5} \approx 4.4721\ldots$

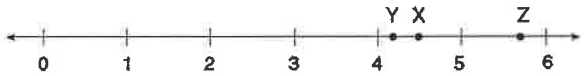
Y = cube root of 68 $\approx 4.0816\ldots$

$Z = \sqrt[4]{2} \approx 1.189\ldots$

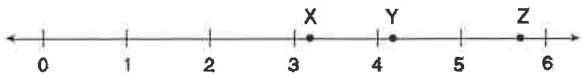
A.



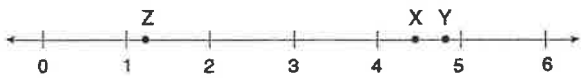
B.



C.



D.



17. Chantal made a mistake in her simplification of $\frac{(3a^5)^{-2}}{a^4}$.

Steps	
I.	$\frac{1}{(3a^5)^2(a^4)}$ ✓
II.	$\frac{1}{(3)^2(a^5)^2(a^4)}$ ✓
III.	$\frac{1}{(9)(a^7)(a^4)}$
IV.	$\frac{1}{9a^{28}}$

Which step contains her first mistake?

A. Step I
B. Step II
C. Step III
D. Step IV

18. Simplify: $\left(\frac{25x^a}{125x^3}\right)^3$

A. $\frac{x^{3a-9}}{125}$

B. $\frac{x^{a-3}}{5}$

C. $125x^{3a-9}$

D. $\frac{x^{27a}}{5}$

$= \left(\frac{1x^a}{5x^3}\right)^3$

$= \frac{x^{3a}}{125x^9}$

$= \frac{x^{3a-9}}{125}$

19. A research assistant calculated the brain mass, b, of an 8 kg cat. She used the formula $b = 0.01m^{\frac{2}{3}}$, where m is the total mass of the cat.

Steps	
I.	$b = 0.01\sqrt[3]{8^2}$ ✓
II.	$b = 0.01\sqrt[3]{16}$
III.	$b \approx 0.01(2.52)$
IV.	$b \approx 0.025$

In which step did the research assistant first make a mistake?

A. Step I
B. Step II
C. Step III
D. Step IV

UNIT 3: Exponents and Radicals Written Response

1. Consider the list of numbers: $-2,\ 0.\overline{4},\ 0,\ 0.343343334\ldots,\ 4.222\ldots,\ \frac{5}{3},\ 7,\ \sqrt{2}$. List all:

   a) Natural numbers 7

   b) Whole numbers 0, 7

   c) Integers $-2, 0, 7$

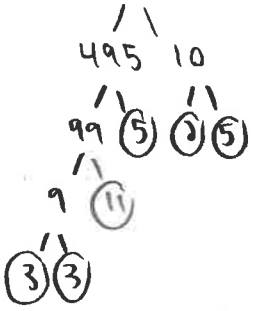
   d) Rational numbers $-2,\ 0.\overline{4},\ 0,\ 4.222\ldots,\ \frac{5}{3},\ 7$

   e) Irrational numbers $0.3433433334\ldots,\ \sqrt{2}$

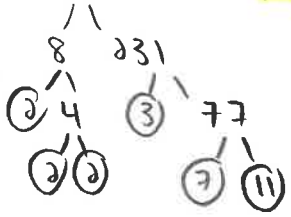
   f) Real numbers $-2,\ 0.\overline{4},\ 0,\ 0.3433433334\ldots,\ 4.222\ldots,\ \frac{5}{3},\ 7,\ \sqrt{2}$

2. Write the numbers as a product of prime numbers.

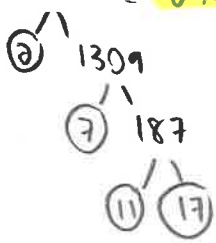
   a) 4950 $= 2\times3^2\times5^2\times11$

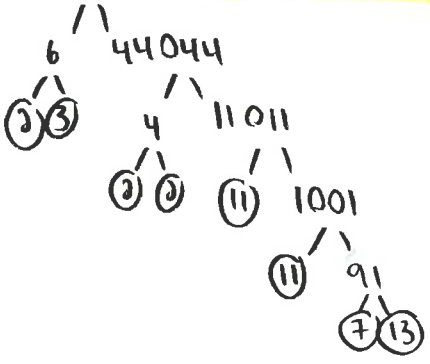
   b) 1848 $= 2^3\times3\times7\times11$

   c) 2618 $= 2\times7\times11\times17$

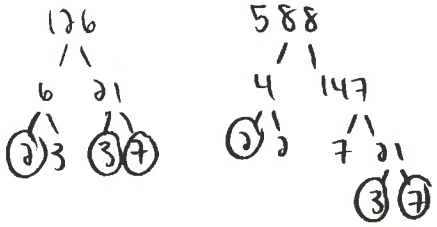
   

   d) 264 264 $= 2^3\times3\times7\times11^2\times13$

3. Find the greatest common factor.

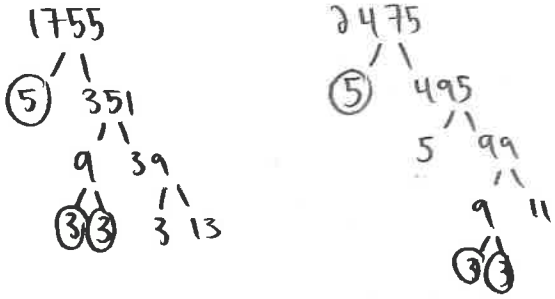
a) 126, 588



GCF = 2 × 3 × 7

= 42

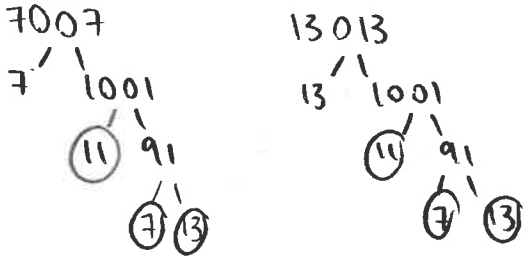
b) 1755, 2475



GCF = $3^2 \times 5$

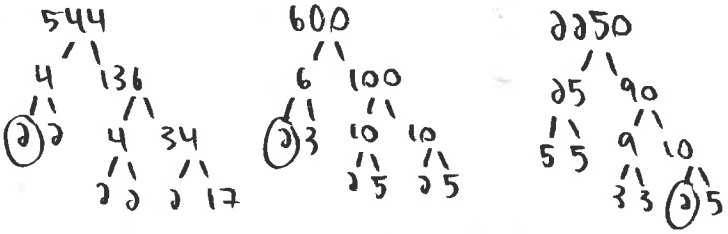
= 45

c) 7007, 13 013



GCF = 11 × 7 × 13 = 1001

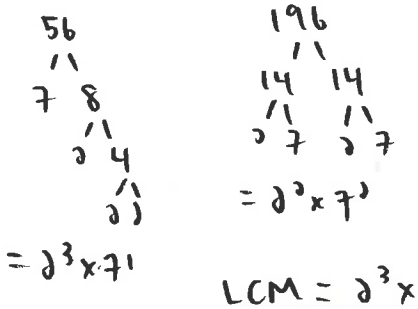
d) 544, 600, 2250



GCF = 2

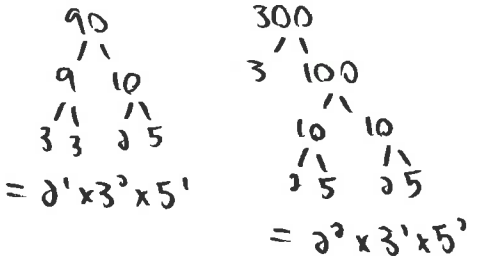
4. Find the least common multiple.

a) 56, 196



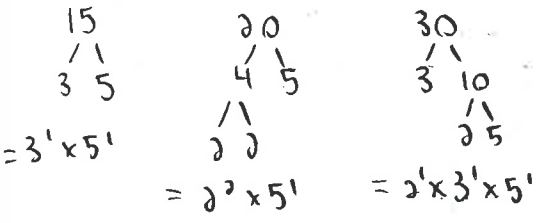
LCM = $2^3 \times 7^2$ = 392

b) 90, 300



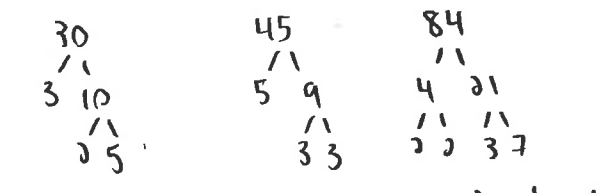
LCM = $2^2 \times 3^2 \times 5^2$ = 900

c) 15, 20, 30



LCM = $2^2 \times 3^1 \times 5^1$ = 60

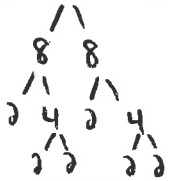
d) 30, 45, 84



LCM = $2^2 \times 3^2 \times 5^1 \times 7^1$ = 1260

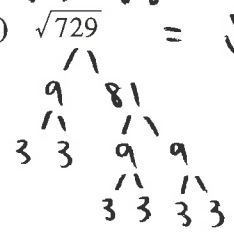
5. Determine the roots without a calculator.

a) $\sqrt{64} = \sqrt{2^6} = (2^6)^{\frac{1}{2}} = 2^3 = 8$



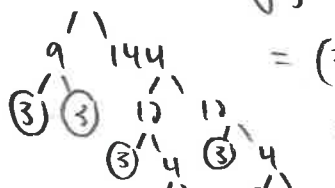
b) $\sqrt[3]{64} = \sqrt[3]{2^6} = (2^6)^{\frac{1}{3}} = 2^2 = 4$

c) $\sqrt{729} = \sqrt{3^6} = (3^6)^{\frac{1}{2}} = 3^3 = 27$

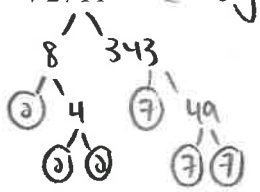


d) $\sqrt[3]{729} = \sqrt[3]{3^6} = (3^6)^{\frac{1}{3}} = 3^2 = 9$

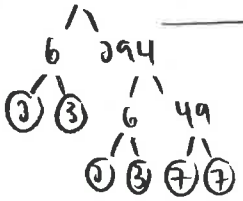
e) $\sqrt{1296} = \sqrt{3^4 \times 2^4} = (3^4)^{\frac{1}{2}} \times (2^4)^{\frac{1}{2}} = 3^2 \times 2^2 = 9 \times 4 = 36$



f) $\sqrt[3]{2744} = \sqrt[3]{2^3 \times 7^3} = (2^3)^{\frac{1}{3}} \times (7^3)^{\frac{1}{3}} = 2^1 \times 7^1 = 14$

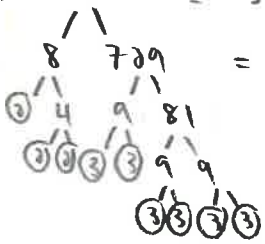


g) $\sqrt{1764}$



$= \sqrt{2^2 \times 3^2 \times 7^2} = 2 \times 3 \times 7 = 42$

h) $\sqrt[3]{5832} = \sqrt[3]{2^3 \times 3^6} = (2^3)^{\frac{1}{3}} \times (3^6)^{\frac{1}{3}} = 2^1 \times 3^2 = 2 \times 9 = 18$



8. Simplify. Express without brackets or negative exponents.

a) $\frac{2^4 \times 2^3}{2^5} = \frac{2^7}{2^5} = 2^2 = 4$

b) $\frac{(3^2)^3 \times (3^4)^2}{(3^5)^2} = \frac{3^6 \times 3^8}{3^{10}} = \frac{3^{14}}{3^{10}} = 3^4 = 81$

c) $\frac{(2x^3)^{-2}}{(x^{-2})^4} = \frac{2^{-2} x^{-6}}{x^{-8}} = \frac{x^8}{2^2 x^6} = \frac{x^2}{4}$

d) $\left(\frac{3x^2}{2y^3}\right)^{-2} = \left(\frac{2y^3}{3x^2}\right)^2 = \frac{4y^6}{9x^4}$

e) $(3a^{-2}b^{-3}c^4)^{-2} = 3^{-2} a^4 b^6 c^{-8} = \frac{a^4 b^6}{3^2 c^8} = \frac{a^4 b^6}{9c^8}$

f) $\left(\frac{3a^{-2}}{2b^3}\right)^{-4} = \left(\frac{2b^3}{3a^{-2}}\right)^4 = \frac{16b^{12}}{81a^{-8}} = \frac{16a^8 b^{12}}{81}$

g) $\frac{(2x^2y^{-3})^2 \times (2x^{-1}y^4)^{-1}}{(2x^{-2}y^2)^{-3}} = \frac{2^2 x^4 y^{-6} \cdot 2^{-1} x^1 y^{-4}}{2^{-3} x^6 y^{-6}} = \frac{2^2 \cdot 2^3 \cdot x^4 x^1 \cdot y^6}{2^1 \cdot x^6 \cdot y^6 \cdot y^4} = \frac{2^4}{x \cdot y^4} = \frac{16}{xy^4}$

h) $\left(\frac{3x^{-1}y}{4x^2y^{-2}}\right)^{-2}\left(\frac{3x^2y^{-2}}{2x^{-2}y}\right)^3$

$\frac{3^{-2} x^2 y^{-2}}{4^{-2} x^{-4} y^4} \cdot \frac{3^3 x^6 y^{-6}}{2^3 x^{-6} y^3}$

$= \frac{4^2 \cdot 3^3}{3^2 \cdot 2^3} \cdot x^2 x^6 x^4 x^6 \cdot \frac{1}{y^2 y^4 y^6 y}$

$= \frac{16 \cdot 3}{8} \cdot x^{16} \cdot \frac{1}{y^{13}} = \frac{6x^{16}}{y^{13}}$

9. Simplify. Evaluate if possible.

a) $32^{\frac{4}{5}} = \left(\sqrt[5]{32}\right)^4$
$= 2^4$
$= 16$

b) $32^{-\frac{4}{5}} = \frac{1}{32^{4/5}} = \frac{1}{\left(\sqrt[5]{32}\right)^4} = \frac{1}{2^4}$
$= \frac{1}{16}$

c) $-625^{\frac{3}{4}} = -\left(\sqrt[4]{625}\right)^3$
$= -5^3$
$= -125$

d) $-625^{-\frac{3}{4}} = -\frac{1}{\left(\sqrt[4]{625}\right)^3} = -\frac{1}{5^3} = -\frac{1}{125}$

e) $(27\times64)^{\frac{4}{3}} = \left(\sqrt[3]{27}\right)^4 \times \left(\sqrt[3]{64}\right)^4$
$= 3^4 \times 4^4$
$= 81 \times 256$
$= 20736$

f) $(27\times64)^{-\frac{4}{3}} = \frac{1}{(27\times64)^{4/3}} = \frac{1}{\left(\sqrt[3]{27}\right)^4 \times \left(\sqrt[3]{64}\right)^4}$
$= \frac{1}{3^4 \times 4^4}$
$= \frac{1}{81\times256} = \frac{1}{20736}$

g) $\left(\frac{16}{81}\right)^{\frac{3}{4}}$
$= \left(\sqrt[4]{\frac{16}{81}}\right)^3 = \frac{\left(\sqrt[4]{16}\right)^3}{\left(\sqrt[4]{81}\right)^3} = \frac{2^3}{3^3} = \frac{8}{27}$

h) $\left(\frac{16}{81}\right)^{-\frac{3}{4}} = \left(\frac{81}{64}\right)^{\frac{3}{4}}$
$= \frac{\left(\sqrt[4]{81}\right)^3}{\left(\sqrt[4]{64}\right)^3} = \frac{3^3}{\left(\sqrt[4]{64}\right)^3} = \frac{27}{\left(\sqrt[4]{64}\right)^3}$

i) $\sqrt[3]{x^6}$
$= (x^6)^{\frac{1}{3}}$
$= x^2$

j) $\sqrt[12]{x^4}$, $x \geq 0$
$= (x^4)^{\frac{1}{12}}$
$= x^{\frac{4}{12}} = x^{\frac{1}{3}}$

k) $\frac{\sqrt{2}}{\sqrt[3]{2}} = \frac{2^{\frac{1}{2}}}{2^{\frac{1}{3}}}$
$= 2^{\frac{1}{2}\cdot\frac{3}{3} - \frac{1}{3}\cdot\frac{2}{2}} = 2^{\frac{3}{6} - \frac{2}{6}}$
$= 2^{\frac{1}{6}}$

l) $\frac{\sqrt[3]{4}}{\sqrt{2}} = \frac{4^{\frac{1}{3}}}{2^{\frac{1}{2}}} = \frac{2^{\frac{2}{3}}}{2^{\frac{1}{2}}}$
$= \frac{(2^2)^{\frac{1}{3}}}{2^{\frac{1}{2}}} = 2^{\frac{2}{3}\cdot\frac{3}{3} - \frac{1}{2}\cdot\frac{3}{3}}$
$= 2^{\frac{4}{6} - \frac{3}{6}} = 2^{\frac{1}{6}}$

m) $\frac{\sqrt[3]{3}}{\sqrt[4]{3}}$
$= \frac{3^{\frac{1}{3}}}{3^{\frac{1}{4}}} = 3^{\frac{1}{3}\cdot\frac{4}{4} - \frac{1}{4}\cdot\frac{3}{3}} = 3^{\frac{4}{12} - \frac{3}{12}} = 3^{\frac{1}{12}}$

n) $\frac{\sqrt[3]{4}}{\sqrt[4]{2}} = \frac{\left(2^2\right)^{\frac{1}{3}}}{2^{\frac{1}{4}}} = \frac{2^{\frac{2}{3}}}{2^{\frac{1}{4}}} = 2^{\frac{2}{3}\cdot\frac{4}{4} - \frac{1}{4}\cdot\frac{3}{3}}$
$= 2^{\frac{8}{12} - \frac{3}{12}} = 2^{\frac{5}{12}}$

o) $\frac{\sqrt{2}\times\sqrt[3]{2}}{\sqrt[4]{2}} = \frac{2^{\frac{1}{2}} \times 2^{\frac{1}{3}}}{2^{\frac{1}{4}}}$
$= 2^{\frac{1}{2}\cdot\frac{6}{6} + \frac{1}{3}\cdot\frac{4}{4} - \frac{1}{4}\cdot\frac{3}{3}}$
$= 2^{\frac{6}{12} + \frac{4}{12} - \frac{3}{12}}$
$= 2^{\frac{7}{12}}$

p) $\frac{\sqrt{3}\times\sqrt[3]{9}}{\sqrt[4]{27}} = \frac{3^{\frac{1}{2}} \times \left(3^2\right)^{\frac{1}{3}}}{\left(3^3\right)^{\frac{1}{4}}} = \frac{3^{\frac{1}{2}} \times 3^{\frac{2}{3}}}{3^{\frac{3}{4}}}$
$= 3^{\frac{1}{2}\cdot\frac{6}{6} + \frac{1}{3}\cdot\frac{4}{4} - \frac{3}{4}\cdot\frac{3}{3}}$
$= 3^{\frac{6}{12} + \frac{4}{12} - \frac{9}{12}}$
$= 3^{\frac{1}{12}}$

1, 4, 9, 16, 25, 36, 49, 64, 81, 100 1, 8, 27, 64, 125

10. Simplify each radical. (ie: write as a mixed radical)

a) $\sqrt{108}$ $= \sqrt{36} \times \sqrt{3}$
$= 6\sqrt{3}$

b) $\sqrt[3]{108}$ $= \sqrt[3]{27} \times \sqrt[3]{4}$
$= 3\sqrt[3]{4}$

c) $\sqrt{288}$ $= \sqrt{144} \times \sqrt{2}$
$= 12\sqrt{2}$

d) $\sqrt[3]{288}$ $= \sqrt[3]{8} \times \sqrt[3]{36}$
$= 2\sqrt[3]{36}$

e) $3\sqrt{54}$ $= 3 \times \sqrt{9} \times \sqrt{6}$
$= 3 \times 3 \times \sqrt{6}$
$= 9\sqrt{6}$

f) $3\sqrt[3]{54}$ $= 3 \times \sqrt[3]{27} \times \sqrt[3]{2}$
$= 3 \times 3 \times \sqrt[3]{2}$
$= 9\sqrt[3]{2}$

g) $2\sqrt{14} \times \sqrt{28}$

h) $2\sqrt[3]{14} \times \sqrt[3]{28}$

i) $-5\sqrt{12} \times \sqrt{54}$

j) $-5\sqrt[3]{12} \times \sqrt[3]{54}$

OMIT

11. Express as an entire radical.

a) $3\sqrt{2}$ $= \sqrt{9} \times \sqrt{4}$
$= \sqrt{36}$

b) $3\sqrt[3]{2}$ $= \sqrt[3]{27} \times \sqrt[3]{2}$
$= \sqrt[3]{54}$

c) $-2\sqrt{5}$ $= -\sqrt{4} \times \sqrt{5}$
$= -\sqrt{20}$

d) $-2\sqrt[3]{5}$ $= -\sqrt[3]{8} \times \sqrt[3]{5}$
$= -\sqrt[3]{40}$

e) $5\sqrt{2} \times 2\sqrt{3}$ $= \sqrt{25} \times \sqrt{2} \times \sqrt{4} \times \sqrt{3}$
$= \sqrt{600}$

f) $5\sqrt[3]{2} \times 2\sqrt[3]{3}$ $= \sqrt[3]{125} \times \sqrt[3]{2} \times \sqrt[3]{8} \times \sqrt[3]{3}$
$= \sqrt[3]{6000}$

g) $3\sqrt{3} \times 2\sqrt{5} \times 4\sqrt{2}$
$= \sqrt{9} \times \sqrt{3} \times \sqrt{4} \times \sqrt{5} \times \sqrt{16} \times \sqrt{2}$
$= \sqrt{17280}$

h) $4\sqrt[3]{3} \times 3\sqrt[3]{4} \times 2\sqrt[3]{2}$
$= \sqrt[3]{64} \times \sqrt[3]{3} \times \sqrt[3]{27} \times \sqrt[3]{4} \times \sqrt[3]{8} \times \sqrt[3]{2}$
$= \sqrt[3]{331776}$

UNIT 4: POLYNOMIALS

MY NOTES AND THINGS TO REMEMBER...

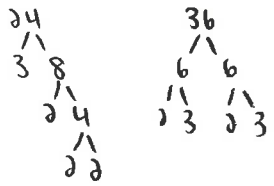
* OMIT WRITTEN RESPONSE #9i.

UNIT 4: Polynomials Multiple Choice

1. Which two numbers have the following properties?
   - Their GCF is 12.
   - Their LCM is 72.

   A. 2 and 3
   B. 24 and 36
   C. 48 and 72
   D. 72 and 864

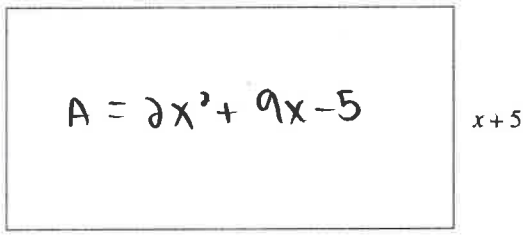
b)



GCF = $2^2 \times 3 = 12$

LCM = $2^3 \times 3^2 = 72$

2. Given that the area of the rectangle below is $2x^2+9x-5$, determine the length of the rectangle.



length

A. $2x-1$
B. $2x+1$
C. $2x+9$
D. $2x^2+8x-10$

$2x^2+9x-5 = (x+5)(2x-1)$

3. Expand and simplify: $(x-4)^3$

A. $x^3-12x^2+48x-64$
B. $x^3+12x^2+48x+64$
C. $x^3-4x^2+16x+64$
D. x^3-64

$= (x-4)(x-4)(x-4)$

$= (x^2-8x+16)(x-4)$

$= x^3-4x^2-8x^2+32x+16x-64$

$= x^3-12x^2+48x-64$

4. Katie simplified the expression $(x+b)(x+c)$, where $b<0$ and $c<0$, to the form x^2+gx+k. What must be true about g and k?

A. $g<0$ and $k>0$
B. $g<0$ and $k<0$
C. $g>0$ and $k>0$
D. $g>0$ and $k<0$

$(x+b)(x+c) = x^2+cx+bx+bc$

$= x^2+(c+b)x+bc$

$(-)+(-) = \ominus$ $\quad$ $(-)(-) = \oplus$

$g<0$ $\quad$ $k>0$

5. Factor: $y^2 - 81$ $= (y-9)(y+9)$

A. $(y-9)^2$

B. $(y+9)^2$

C. $(y+9)(y-9)$

D. $(y+3)(y-3)(y+9)$

6. Which of the following expressions have a factor of $x+2$?

I.	$x^2 - 4$
II.	$2x^2 - x - 10$
III.	$5x + 10$

$= (x-2)(x+2)$

$= (2x-5)(x+2)$

$= 5(x+2)$

-5×2

A. I only

B. III only

C. I and III only

D. I, II and III

7. Expand and simplify: $(4x-3)^2$

$= (4x-3)(4x-3)$

$= 16x^2 - 12x - 12x + 9$

$= 16x^2 - 24x + 9$

A. $16x^2 + 9$

B. $16x^2 - 12x + 9$

C. $16x^2 - 24x - 9$

D. $16x^2 - 24x + 9$

8. Pam expanded and simplified $(x-3)(x^2+2x-4)$, as shown below.

Steps	
I.	$x(x^2+2x-4) - 3(x^2+2x-4)$ ✓
II.	$x^3 + 2x^2 - 4x - 3x^2 + 6x - 12$
III.	$x^3 - x^2 + 2x - 12$

In which step is Pam's first error?

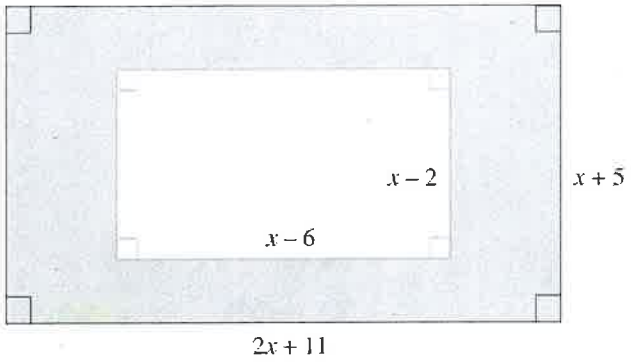
A. Step I

B. Step II

C. Step III

D. There is no mistake.

9. Determine an expression to represent the shaded area below.



A. x^2+43
B. $x^2+13x+67$
C. $x^2+29x+43$
D. $3x^2+13x+67$

$A = (2x+11)(x+5) - (x-6)(x-2)$
$= (2x^2+10x+11x+55) - (x^2-2x-6x+12)$
$= (2x^2+21x+55) - (x^2-8x+12)$
$= 2x^2+21x+55-x^2+8x-12$
$= x^2+29x+43$

10. Determine the greatest common factor of $12x^5y$, $4x^3y^2$ and $6x^2y^4$.

A. $2xy$
B. $2x^2y$
C. $4x^3y^2$
D. $12x^5y^4$

$2x^2y$

11. Which of the following expressions is a factor of $x^2-8x-20$?

A. $x-2$
B. $x-4$
C. $x-5$
D. $x-10$

$(x+2)(x-10)$

20

1	20
2	10
4	5

12. When completely factored, how many factors does $2x^4-24x^2-128$ have?

A. 2
B. 3
C. 4
D. 5

$= 2(x^4-12x^2-64)$
$= 2(x^2-16)(x^2+4)$
$= 2(x-4)(x+4)(x^2+4)$

64

1	64
2	32
4	16
8	8

UNIT 4: Polynomials Written Response

1. Find the value of the polynomial when $x = -3$.

a) $-3x^3 + x - 2$

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

$= -3(-27) - 3 - 2$

$= 81 - 3 - 2 \quad = 76$

b) $-x^4 - 2x^3$

$= -(-3)^4 - 2(-3)^3$

$= -(81) - 2(-27)$

$= -81 + 54 \quad = -27$

c) $x^5 - 9x^3 + x - 9$

$= (-3)^5 - 9(-3)^3 + (-3) - 9$

$= -243 + 243 - 3 - 9$

$= -12$

d) $-2x^3 - 5x^2 + 3x - 1$

$= -2(-3)^3 - 5(-3)^2 + 3(-3) - 1$

$= -2(-27) - 5(9) - 9 - 1$

$= 54 - 45 - 9 - 1 \quad = -1$

e) $x^4 - 2x^3 - 2x^2 + x - 1$

$= (-3)^4 - 2(-3)^3 - 2(-3)^2 + (-3) - 1$

$= 81 + 54 - 18 - 3 - 1$

$= 113$

f) $-4x^3 - 2x^2 + 5x - 4$

$= -4(-3)^3 - 2(-3)^2 + 5(-3) - 4$

$= -4(-27) - 2(9) - 15 - 4$

$= 108 - 18 - 15 - 4$

$= 71$

2. Find the product.

a) $(2x^2y)(3x^4y^3)$

$= 6x^6y^4$

b) $-2x^2y^4(3x^3y)$

$= -6x^5y^5$

c) $2ab(-3a^2b + 2ab^2 - 5ab)$

$= -6a^3b^2 + 4a^2b^3 - 10a^2b^2$

d) $-3a^2(2a + 3a^2 - a^4)$

$= -6a^3 - 9a^4 + 3a^6$

e) $(2a^2)(3b)(-a^3b^2+4ab^3)$

$= 6a^2b(-a^3b^2+4ab^3)$

$= -6a^5b^3+24a^3b^4$

f) $-ab^2c(a^2b^2c-abc^2-a^3b^2)$

$= -a^3b^4c^2+a^2b^3c^3+a^4b^4c$

g) $(-2x^2y)(3xy^3)(4x^2-5y^2)$

$= -6x^3y^4(4x^2-5y^2)$

$= -24x^5y^4+30x^3y^6$

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

$= 2x^3y^5(x^2-xy+y^2)$

$= 2x^5y^5-2x^4y^6+2x^3y^7$

i) $(-3xy^3)(4x^3y^2)(-3x^3+y^3)$

$= -12x^4y^5(-3x^3+y^3)$

$= 36x^7y^5-12x^4y^8$

j) $(-2x^3y^2)(x^3y^4)(2x^2-3xy-y^3)$

$= -2x^6y^6(2x^2-3xy-y^3)$

$= -4x^8y^6+6x^7y^7+2x^6y^9$

3. Multiply.

a) $(3x-2)(2x+3)$

$= 6x^2 + 9x - 4x - 6$

$= 6x^2 + 5x - 6$

b) $(2x^2-1)(4x^2-3)$

$= 8x^4 - 6x^2 - 4x^2 + 3$

$= 8x^4 - 10x^2 + 3$

c) $(1-2x)(3+x-2x^2)$

$= 3 + x - 2x^2 - 6x - 2x^2 + 4x^3$

$= 4x^3 - 4x^2 - 5x + 3$

d) $(x-2y)(3x+4y)$

$= 3x^2 + 4xy - 2xy - 8y^2$

$= 3x^2 + 2xy - 8y^2$

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

$= 6x^3 - 2x^2y + 4xy^2$
$\quad + 3x^2y - xy^2 + 2y^3$

$= 6x^3 + x^2y + 3xy^2 + 2y^3$

f) $(3x-1)^2$

$= (3x-1)(3x-1)$

$= 9x^2 - 3x - 3x + 1$

$= 9x^2 - 6x + 1$

g) $(2x-3y)^2$

$= (2x-3y)(2x-3y)$

$= 4x^2 - 6xy - 6xy + 9y^2$

$= 4x^2 - 12xy + 9y^2$

h) $(x-2)^3$

$= (x-2)(x-2)(x-2)$

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

$= x^3 - 2x^2 - 4x^2 + 8x + 4x - 8$

$= x^3 - 6x^2 + 12x - 8$

4. Factor.

a) $9x^5 - 6x^3 + 3x$

$= 3x(3x^4 - 2x^2 + 1)$

$= 3x(3x^2 + 1)(x^2 - 1)$

b) $2x(x-2) - 3(x-2)$

$= (x-2)(2x-3)$

c) $x(x-1) - 2(1-x)$

$= x(x-1) + 2(x-1)$

$= (x-1)(x+2)$

d) $x^2 - xy + 2x - 2y$

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

$= x(x-y) + 2(x-y)$

$= (x-y)(x+2)$

e) $1 - x + y - xy$

$= (1-x) + (y - xy)$

$= (1-x) + y(1-x)$

$= (1-x)(1+y)$

f) $x^3 - 3x^2 + 2x - 6$

$= (x^3 - 3x^2) + (2x - 6)$

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

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

g) $3x^3 + 6x^2 - 4x - 8$

$= (3x^3 + 6x^2) - (4x + 8)$

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

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

h) $ab^2 - a^2 + 2b^2 - 2a$

$= (ab^2 - a^2) + (2b^2 - 2a)$

$= a(b^2 - a) + 2(b^2 - a)$

$= (b^2 - a)(a+2)$

5. Factor.

a) $x^2 + 7x + 6$

$= (x+6)(x+1)$

b) $x^2 + 9x + 14$

$= (x+7)(x+2)$

c) $x^2 + 9x + 18$

$= (x+3)(x+9)$

d) $x^2 - 8x + 7$

$= (x-1)(x-7)$

e) $x^2 - 6x + 9$

$= (x-3)(x-3)$

$= (x-3)^2$

f) $x^2 - 12x + 35$

$= (x-7)(x-5)$

g) $x^2 + 2x - 15$

$= (x+5)(x-3)$

h) $x^2 - 3x - 4$

$= (x-4)(x+1)$

i) $3x^2 + 6x - 24$

$= 3(x^2 + 2x - 8)$

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

j) $-3x^2 + 12x - 12$

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

$= -3(x-2)(x-2)$

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

k) $-2x^3 + 2x^2 + 12x$

$= -2x(x^2 - x - 6)$

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

l) $-2x^4 + 8x^3y - 8x^2y^2$

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

$= -2x(x-2y)(x-2y)$

$= -2x(x-2y)^2$

m) $x^2 - x + \frac{3}{16}$

4×-1, 4×-3

$= \frac{1}{16}(16x^2 - 16x + 3)$

$= \frac{1}{16}(4x-1)(4x-3)$

n) $x^2 - \frac{1}{4}x - \frac{1}{8}$

$= \frac{1}{8}(8x^2 - 2x - 1)$

2×-1, 4×1

$= \frac{1}{8}(2x-1)(4x+1)$

o) $2x^2 - 4x$

$= 2x(x-2)$

p) $3x^3 - 3x^2 - 6x$

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

$= 3x(x-2)(x+1)$

q) $(x+1)^2 - 4(x+1) + 3$

$= [(x+1) - 3][(x+1) - 1]$

$= (x+1-3)(x+1-1)$

$= (x-2)(x)$

r) $(x-3)^2 - (x-3) - 6$

$= [(x-3) - 3][(x-3) + 2]$

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

$= (x-6)(x-1)$

s) $x^2 - \frac{1}{2}x - \frac{15}{2}$

1×-3, 2×5

$= \frac{1}{2}(2x^2 - x - 15)$

$= \frac{1}{2}(x-3)(2x+5)$

t) $x^2 + \frac{5}{3}x + \frac{2}{3}$

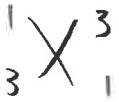
$= \frac{1}{3}(3x^2 + 5x + 2)$

1×1, 3×2

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

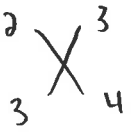
6. Factor.

a) $3x^2 + 10x + 3$



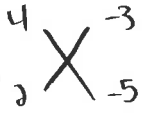
$= (x+3)(3x+1)$

b) $6x^2 + 17x + 12$



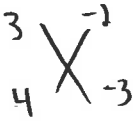
$= (2x+3)(3x+4)$

c) $8x^2 - 26x + 15$



$= (4x-3)(2x-5)$

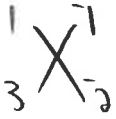
d) $12x^2 - 17x + 6$



$= (3x-2)(4x-3)$

e) $-3x^2 + 5x - 2$

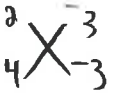
$= -(3x^2 - 5x + 2)$



$= -(x-1)(3x-2)$

f) $-8x^2 + 18x - 9$

$= -(8x^2 - 18x + 9)$



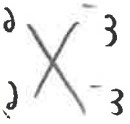
$= -(2x-3)(4x-3)$

g) $6x^2 - 15xy + 6y^2$

$= 3(2x^2 - 5xy + 2y^2)$

$= 3(2x-y)(x-2y)$

h) $-8x^2 + 24xy - 18y^2$



$= -2(4x^2 - 12xy + 9y^2)$

$= -2(2x-3y)(2x-3y)$

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

7. Factor.

a) $x^2 - 9$

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

b) $9x^2 - 4$

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

c) $x^2 - 4y^2$

$= (x-2y)(x+2y)$

d) $9x^4 - 49y^2$

$= (3x^2-7y)(3x^2+7y)$

e) $x^4 - 16$

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

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

f) $3x^2 - 12y^2$

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

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

g) $(x-2)^2 - 9y^2$

$= [(x-2)-3y][(x-2)+3y]$

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

h) $(x+1)^2 - (y-3)^2$

$= [(x+1)-(y-3)][(x+1)+(y-3)]$

$= (x+1-y+3)(x+1+y-3)$

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

8. Factor.

a) $x^2 + 6x + 9$

$= (x+3)(x+3)$

$= (x+3)^2$

b) $x^2 - 8x + 16$

$= (x-4)(x-4)$

$= (x-4)^2$

c) $4x^2 + 24x + 36$

$= 4(x^2 + 6x + 9)$

$= 4(x+3)(x+3)$

$= 4(x+3)^2$

d) $-16x^2 + 80x - 100$

$= -4(4x^2 - 20x + 25)$

$= -4(2x-5)(2x-5)$

$= -4(2x-5)^2$

e) $x^3 + 8x^2 + 16x$

$= x(x^2 + 8x + 16)$

$= x(x+4)(x+4)$

$= x(x+4)^2$

f) $4x^2 - 12xy + 9y^2$

$= (2x-3y)(2x-3y)$

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

g) $-27x^2 + 18xy - 3y^2$

$= -3(9x^2 - 6xy + y^2)$

$= -3(3x-y)(3x-y)$

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

h) $-16x^2 - 24xy - 9y^2$

$= -(16x^2 + 24xy + 9y^2)$

$= -(4x+3)(4x+3)$

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

i) $1 - 12x + 36x^2$

$= (1-6x)(1-6x)$

$= (1-6x)^2$

j) $-25x^2 + 20xy - 4y^2$

$= -(25x^2 - 20xy + 4y^2)$

$= -(5x-2y)(5x-2y)$

$= -(5x-2y)^2$

k) $49x^2 + 28xy + 4y^2$

$= (7x+2y)(7x+2y)$

$= (7x+2y)^2$

l) $16x^2 - 40x^3 + 25x^4$

$= x^2(16 - 40x + 25x^2)$

$= x^2(4-5x)(4-5x)$

$= x^2(4-5x)^2$

m) $-18x^3 - 24x^2y - 8xy^2$

$= -2x(9x^2 + 12xy + 4y^2)$

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

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

n) $-12x^3 - 36x^2y - 27xy^2$

$= -3x(4x^2 + 12xy + 9y^2)$

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

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

o) $-4x^4 - 4x^3y - x^2y^2$

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

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

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

p) $-9x^4 - 6x^3y - x^2y^2$

$= -x^2(9x^2 + 6xy + y^2)$

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

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

9. Factor.

a) $6x^3 - 6x$

$= 6x(x^2 - 1)$

$= 6x(x-1)(x+1)$

b) $a^2b - 2ab^2 + b^3$

$= b(a^2 - 2ab + b^2)$

$= b(a-b)(a-b)$

$= b(a-b)^2$

c) $(x-2)^2 - 2(x-2) - 3$

$= [(x-2)-3][(x-2)+1]$

$= (x-5)(x-1)$

d) $2x + yz + 2z + xy$

$= 2x + 2z + yz + xy$

$= (2x + 2z) + (yz + xy)$

$= 2(x+z) + y(z+x)$

$= (x+z)(2+y)$

e) $6x^3 + x^2 - 5x$

$= x(6x^2 + x - 5)$ $\quad 6 \times {}^{1}_{-5}$

$= x(x+1)(6x-5)$

f) $2x^3 - 2x(x+2)$

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

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

$= 2x(x-2)(x+1)$

g) $x^2(x+10) - 2x(x-8)$

$= x^3 + 10x^2 - 2x^2 + 16x$

$= x^3 + 8x^2 + 16x$

$= x(x^2 + 8x + 16)$

$= x(x+4)(x+4)$ $= x(x+4)^2$

h) $-9x^2y^2 + 6xy - 1$ $\quad 3 \times {}^{-1}_{-1}$

$= -(9x^2y^2 - 6xy + 1)$

$= -(3xy-1)(3xy-1)$

$= -(3xy-1)^2$

i) $2^{2x} - 2^{x+1} + 1$

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j) $8a^2x^3y - 2b^2xy$

$= 2xy(4a^2x^2 - b^2)$

$= 2xy(2ax - b)(2ax + b)$

k) $a^2c + a^2d^2 - b^2c - b^2d^2$

$= (a^2c + a^2d^2) - (b^2c + b^2d^2)$

$= a^2(c+d^2) - b^2(c+d^2)$

$= (c+d^2)(a^2 - b^2)$

$= (c+d^2)(a-b)(a+b)$

l) $x^2y^2 - 4x^2 - y^2 + 4$

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

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

$= (y^2 - 4)(x^2 - 1)$

$= (y-2)(y+2)(x-1)(x+1)$