Prime Numbers

Prime Numbers

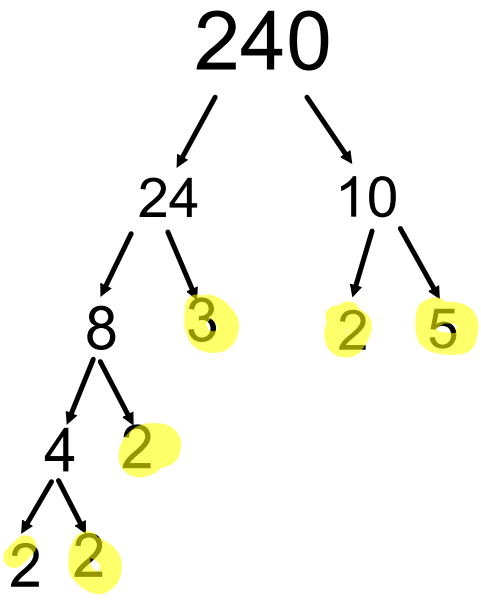
A Prime Number can be divided evenly **only** by 1 & itself.
And it must be a whole number greater than 1.

The first few prime numbers are 2, 3, 5, 7, 11, 13, 17 etc.....

Determining the Prime Factors of a Whole Number

Write the prime factorization of 240

Draw a Factor Tree !!



The Prime Factorization of 240 is:

$2 \times 2 \times 2 \times 3 \times 5 \times 2$ or $2^4 \times 3 \times 5$

The Prime Factors of 240 are:

2, 3, & 5

Distributing Factors

3.7 Multiplying Polynomials

Expand & Simplify

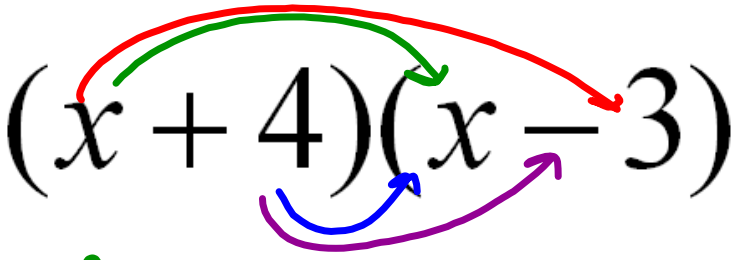
Rainbow

Expand and Simplify

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

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

$2x^2 + 10x$

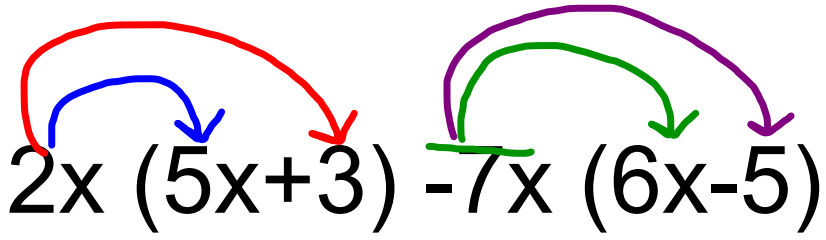


Rainbow

$x^2 \quad -3x + 4x - 12$

$x^2 + 1x - 12$

Expand and collect like terms.



$10x^2$ $+6x$ $-42x^2$ $+35x$

$10x^2 - 42x^2 \qquad +6x + 35x$

$-32x^2 \qquad +41x$

top side

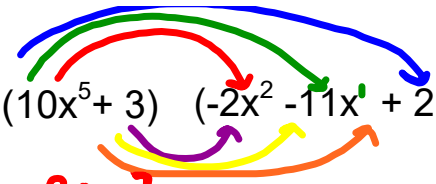
$$(x+4)(x-3)$$

	x	+4
x	x^2	+ 4X
-3	-3x	-12

$x^2 + 4x - 3x - 12$

$x^2 + 1x - 12$

5) $(10x^5 + 3)(-2x^2 - 11x^1 + 2)$



$-20x^7 - 110x^6 + 20x^5 - 6x^2 - 33x + 6$

Expand and simplify

repeat bracket twice

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

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

Rainbow

$x^2 - 1x - 1x + 1 + x^2 + 4x + 4x + 16$

$x^2 - 2x + 1 + x^2 + 8x + 16$

$2x^2 + 6x + 17$

Factoring

There are 5 different kinds of Factoring:

- **Greatest common factor (GCF)**
- **Simple Trinomials (Factor by Inspection)**
- **Hard Trinomials (Factor by Decompostion)**
- **Special Factors**
  - **Difference of Squares**
  - **Perfect Square Trinomials**

Simple Trinomials

- has three terms with the form...

$$ax^2 + bx + c$$

- a simple trinomial has an "a" value of 1.

- we use a method of inspection to factor them.

CHECK IT OUT!!!

INSPECTION METHOD

- here's how it goes... "What two numbers?"

Adds to get "b"

$$ax^2 + bx + c$$

Multiplies to get "c"

EXAMPLES... SOLUTIONS

1) $x^2 + 13x - 48$

last multiply -48 middle add $+13$

1×48
2×24
3×16
4×12
6×8

sign on largest factor

⊕ then both same sign

⊖ so sign are diff

largest factor ⊕

$(x-3)(x+16)$

2) $x^2 - 10x - 24$

3) $2x^2 - 20x + 42$

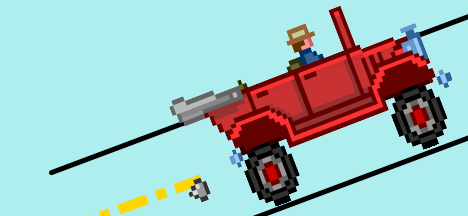
$2(x^2 - 10x + 21)$

simple

$2(x-3)(x-7)$

1) GCF
2) Simp
3) Thr
4) Diff
5) Perfect Tri

Rules of the road...



x^2+5x-6

Sign of the biggest number.

Signs are different.

x^2-5x+6

Sign of the biggest number.

Signs are the same.

GCF factoring

↳ look for largest common number/variables that divides out of each term

$24x^4y^3 - 6x^2y^1 + 21x^3y^0$

$3x^1y^1(8y^2 - 2x^1 + 7x^3y^1)$

Hard Trinomials

- has three terms with the form...

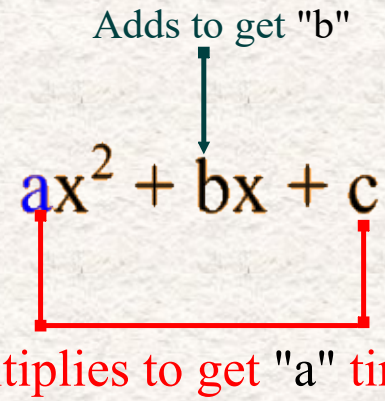
$$ax^2 + bx + c$$

- a hard trinomial has an "a" value **not equal to 1**.

- we use a method of decomposition to factor them.

DECOMPOSITION METHOD

- here's how it goes... "What two numbers?"



- once you find the two numbers, use them to break the MIDDLE TERM into two pieces (decomposition).

- then, factor by grouping.

Factor Completely!

1. $2x^2+5x+3$

1st x Last → mult → +6 → +1 x +6, +2 x +3

middle → add → +5

sign on largest factor → +

⊕ Signs are both the same

Rewrite middle term using the 2 factors

$2x^2 + 2x + 3x + 3$

factor out GCF

Factor out GCF

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

same

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

Difference of Squares

- two terms that are perfect squares.
- must be a difference
- factor like this...

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

EXAMPLES...

both perfect square

1) $4x^2 - 49$

$(2x+7)(2x-7)$

2) $16x^2 - 9y^2$

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

3) $81z^4 - 625$

$(9z^2-25)(9z^2+25)$

4) $49w^2 - 4s^2$

Perfect Square Trinomials

- three terms: the first and last are perfect squares.
- factors like this...

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

OR

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

- recognize them and you save yourself the decomposition steps!!!

EXAMPLES...

Both perfect sq. #

1) $25x^2 - 10x + 1$

$(5x \pm 1)^2$

perfect sq

2) $9x^2 + 24x + 16$

$(3x + 4)^2$

Review Questions

Q

1. $9x^2 - y^2$

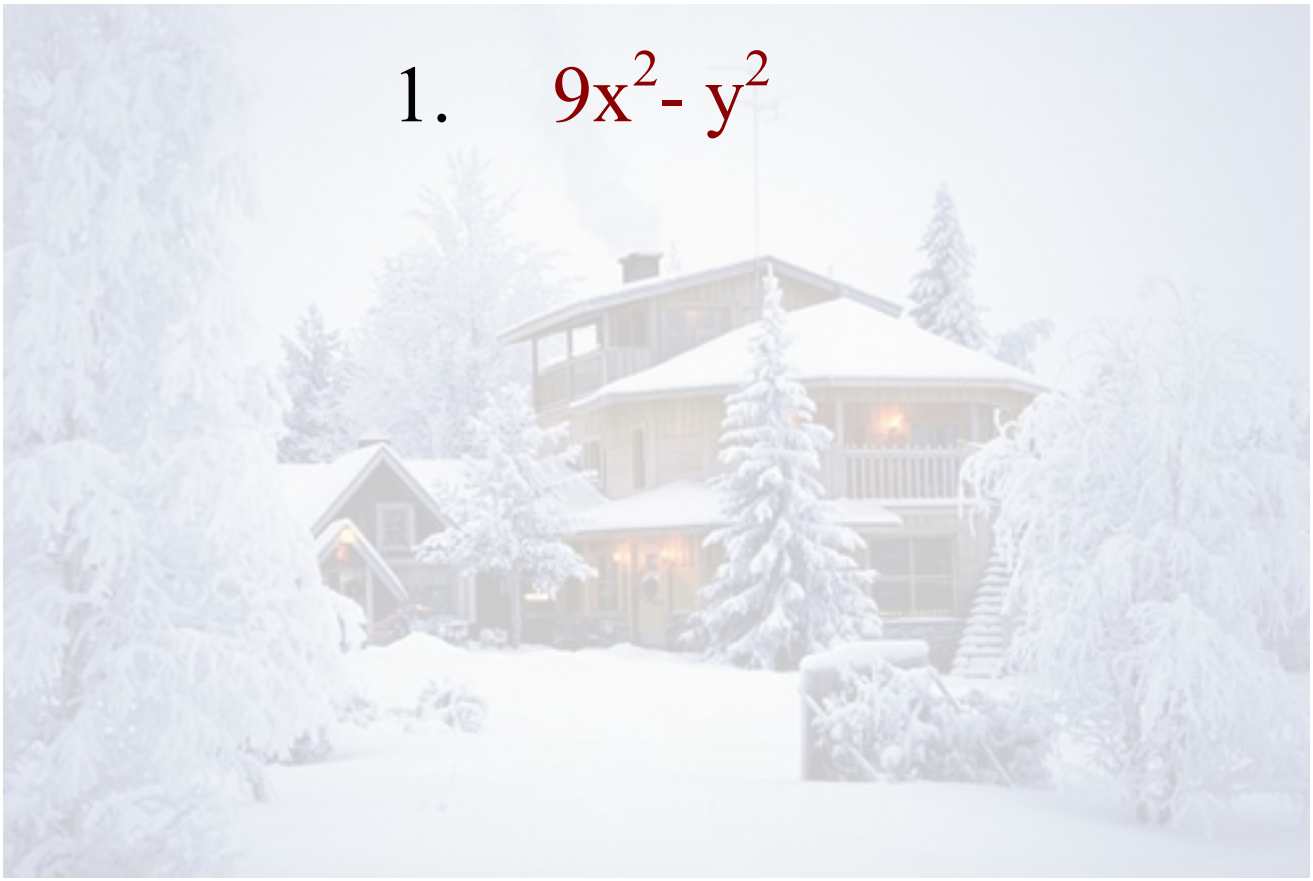
2. $2x^2-x-15$

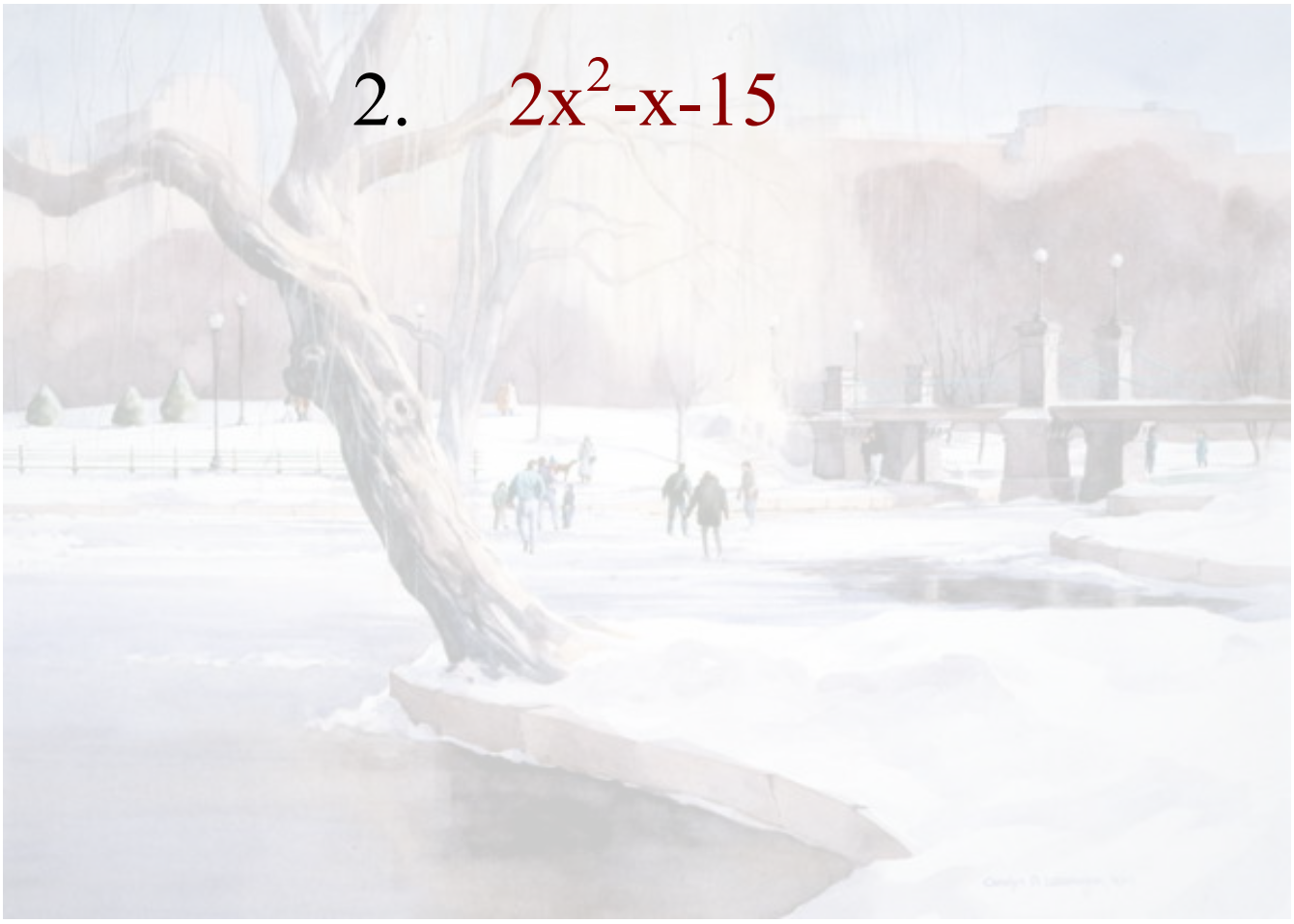
3. $3a^2b^2+27a^4b^7-12a^6b^5$

4. $3x^2-27x+42$

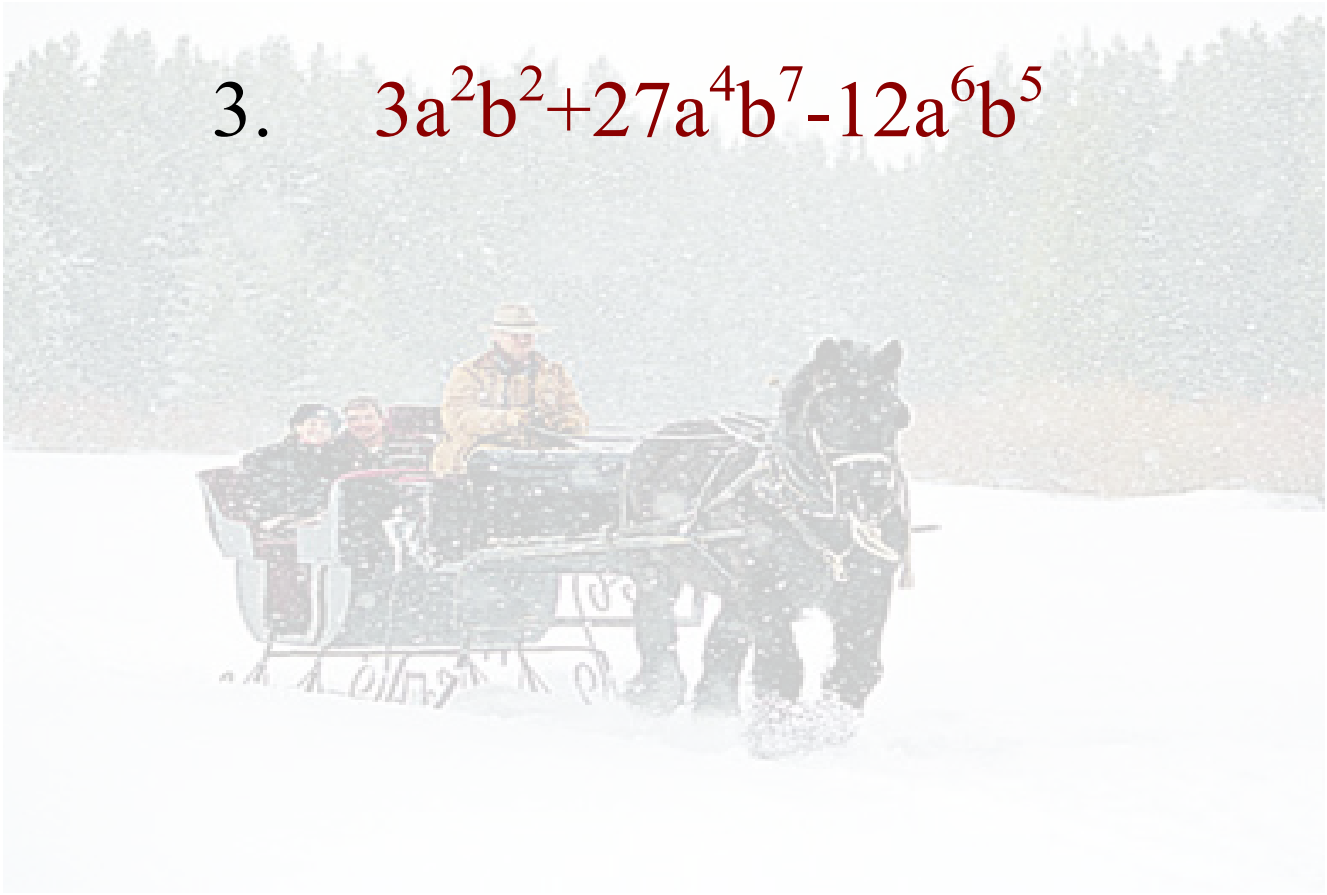
5. $24x^4+10x^2+4$

6. $(x+1)^2 - (x+5)^2$

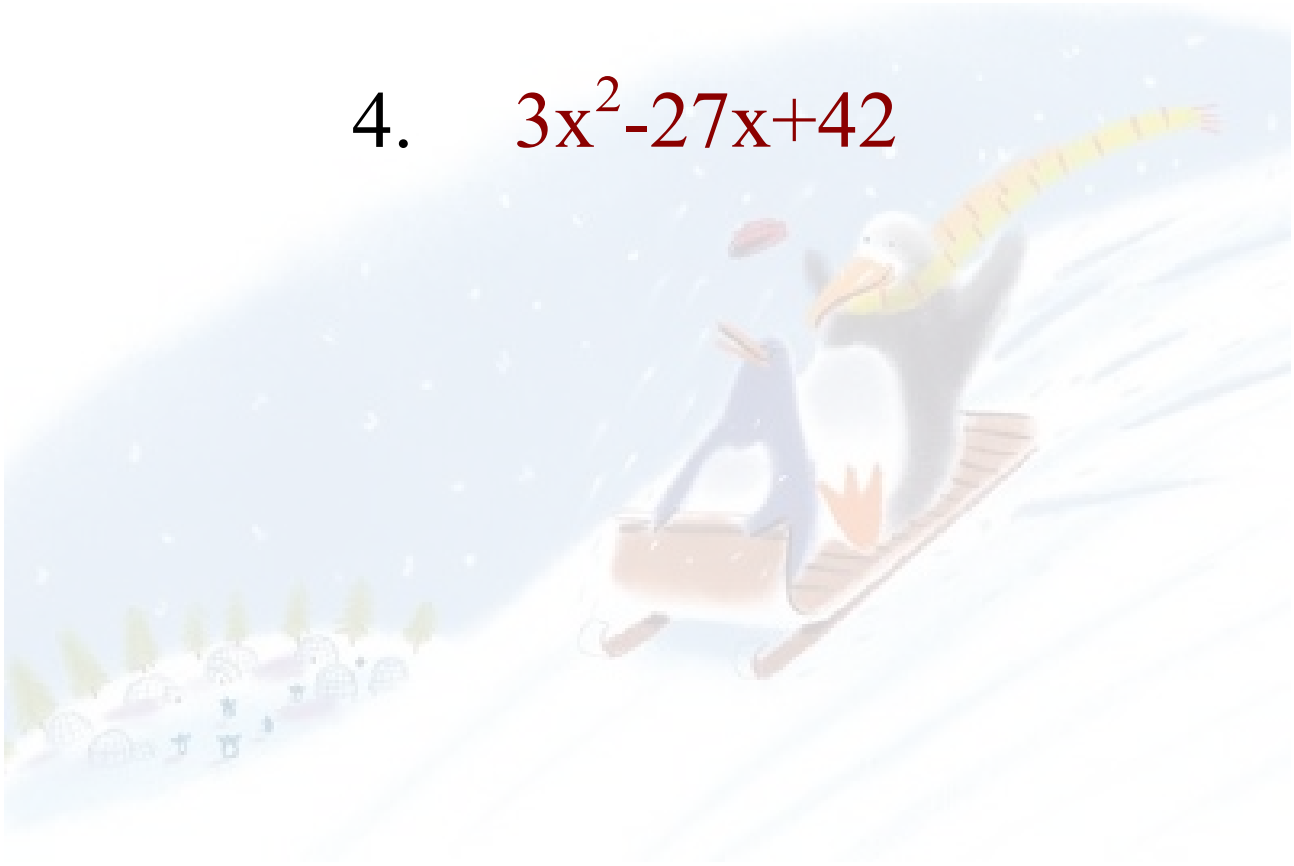

1. $9x^2 - y^2$

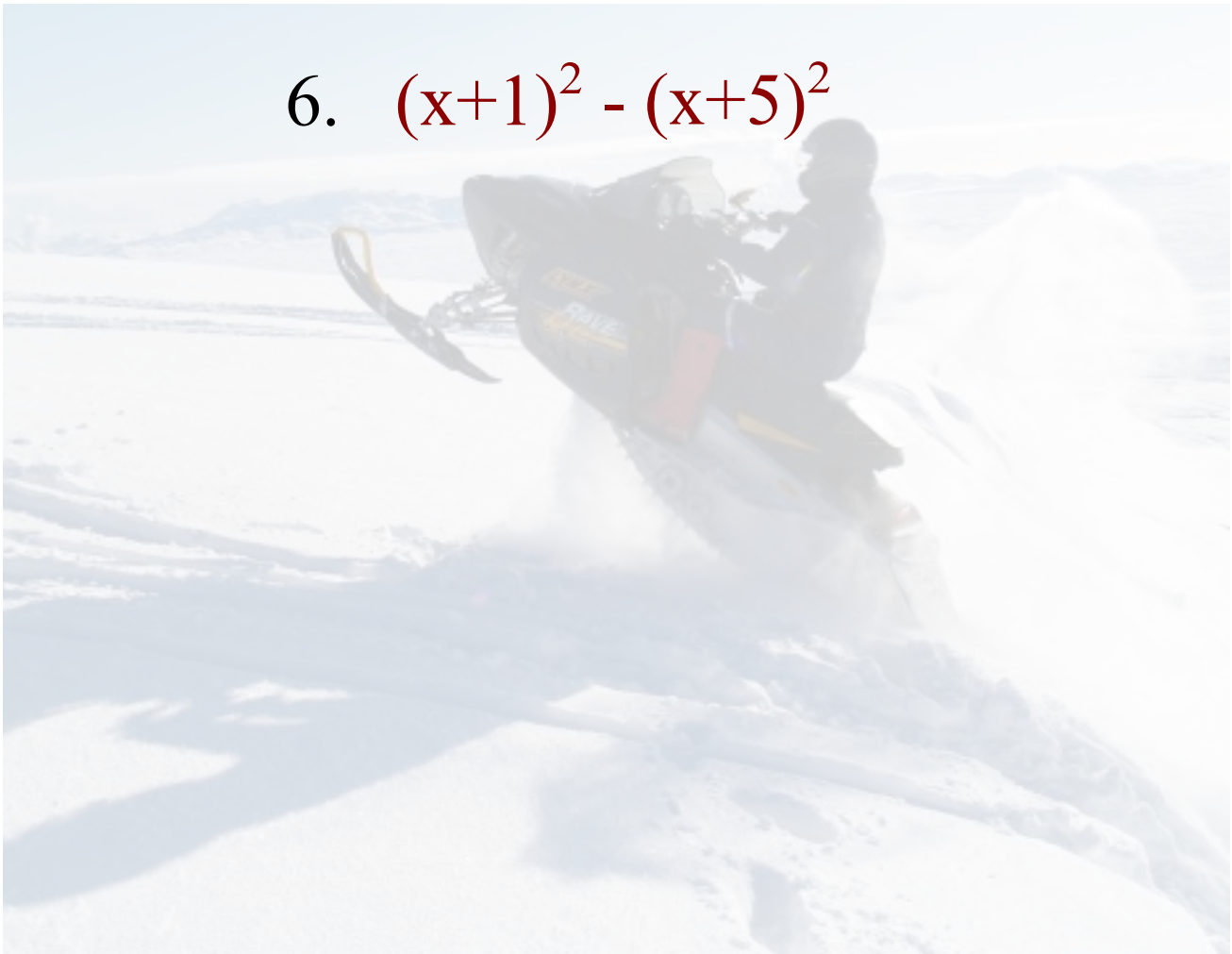

2. $2x^2-x-15$

3. $3a^2b^2+27a^4b^7-12a^6b^5$



4. $3x^2-27x+42$




6. $(x+1)^2 - (x+5)^2$

7. $(x-2)^2 - 9(x+1)^2$

Factoring Review

Math 10B

Factor each completely:

1) $6b^2a^2 - 24b^2$

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

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

4) $m^2 - 10m - 11$

5) $25x^2 - 30x + 9$

6) $2n^2 - 9n + 9$

7) $15x^{11} - 12y^2$

8) $2a^2 - 7a^2 - 20a + 70$

9) $4x^2 + [illegible]xy + 625y^2$

10) $36n^2 - 32$

11) $a^2 - 9a - 36$

12) $6v^3 - 48v - 2v^2 + 16$

13) $-56x^3 + 80$

14) $9m^4 + 30m^2n^2 + 25n^4$

15) $5v^2 - 26v - 63$

16) $64x^2 - 36y^2$

17) $2x^2 - 2x - 40$

18) $4x^2 - 25$

19) $3x^2 - 17xy + 10y^2$

20) $40x^3 - 5x^2 - 32x + 4$

21) $25r^2 - 49$

22) $p^2 - 5p - 84$