Factoring Polynomials: Exercise 5

Name: _____

[29 marks total]

Date: _____

ax^2+bx+c

Factor each of the following. Show your work on lined paper. Your work on finding the two numbers (steps i) to v)) need not be shown, but the factoring that follows must be clearly written out. Be prepared to hand this work in during Lesson 22.

Part A [23 marks]

1) [1 mark] $6a^2+11a+3$

2) [1 mark] $20x^2-23x+6$

3) [1 mark] $15y^2-29y-14$

4) [1 mark] $8m^2-30m-27$

5) [2 marks] $1260b^2+248b-1764$

6) [1 mark] $6800d^2+1125d-5832$

7) [1 marks] $3364g^2-10\,556g+8281$

8) [3 marks] $400d^4-4049d^2+7744$

9) [1 mark] $400h^2-11\,130h+21\,609$

10) [2 marks] $2\,085\,136k^4-5\,848\,200k^2+4\,100\,625$

11) [3 marks] $36(2a^2-3)^2-44(2a^2-3)-15$

12) [2 marks] $81(7a+3)^4-72(7a+3)^2+16$

13) [2 marks] $504m^2-840m+294$

14) [2 marks] $6188n^2+1105n-17\,017$

Part B [6 marks]

Before factoring using ax^2+bx+c, two other types of factoring should be tested.

a) Explain how these two types may simplify your work.

b) Give one example of each of these two types from the questions in Part A.

FP Exercise 5

1) $P = 6 \times 3 = 18$
$S = 11$

① $11 \div 2 = 5.5$
② $(5.5)^2 = 30.25$
③ $30.25 - 18 = 12.25$
④ $\sqrt{12.25} = 3.5$
⑤ $5.5 - 3.5 = 2$
$5.5 + 3.5 = 9$
⑥ $6a^2 + 2a + 9a + 3$
⑦ $2a(3a+1)$
$3(3a+1)$
⑧ $2a(3a+1) + 3(3a+1)$
⑨ $(3a+1)(2a+3)$

2) $P = 20 \times 6 = 120$
$S = -23$

① $-23 \div 2 = -11.5$
② $(-11.5)^2 = 132.25$
③ $132.25 - 120 = 12.25$
④ $\sqrt{12.25} = 3.5$
⑤ $-11.5 - 3.5 = -15$
$-11.5 + 3.5 = -8$
⑥ $20x^2 + 15x - 8x + 6$
⑦ $5x(4x-3)$
$-2(4x-3)$
⑧ $5x(4x-3) - 2(4x-3)$
⑨ $(4x-3)(5x-2)$

3) $P = 15x - 14 = -210$
$S = -29$

① $-29 \div 2 = -14.5$
② $(-14.5)^2 = 210.25$
③ $210.25 + 210 = 420.24$
④ $\sqrt{420.25} = 20.5$
⑤ $20.5 - 14.5 = 35$
$20.5 + 14.5 = -6$
⑥ $15y^2 + 35y - 6y - 14$
⑦ $5x(3y-7)$
$2(3y-7)$
⑧ $5x(3y-7) + 2(3y-7)$
⑨ $(5x+2)(3y-7)$

4) $P = 8x - 27 = -216$
$S = -30$

① $-30 \div 2 = -15$
② $(-15)^2 = 225$
③ $225 + 216 = 441$
④ $\sqrt{441} = 21$
⑤ $-15 - 21 = -36$
$-15 + 21 = 6$
⑥ $8m^2 - 36m + 6m - 27$
⑦ $4m(2m-9)$
$3(2m-9)$
⑧ $4m(2m-9) + 3(2m-9)$
⑨ $(4m+3)(2m-9)$

FP Exercise 5

I just reslized that we don't need to show steps i-v

5) 1620, -1372

⑥ $1260b^2 + 1620b - 1372b - 1764$

⑦ $180b(7b+9)$
$-196(7b+9)$

⑧ $180b(7b+9) - 196(7b+9)$

⑨ $(180b - 196)(7b+9) \longrightarrow 4(45b-49)(7b+9)$

6) 6885 -5760

⑥ $6800d^2 + 6885d - 5760d - 5832$

⑦ $85d(80d+81)$
$-72(80d+81)$

⑧ $85d(80d+81) - 72(80d+81)$

⑨ $(85d - 72)(80d+81)$

7) PERFECT SQUARE POLYNOMIAL

$3364g^2 - 10556g + 8281$

$\sqrt{3364g^2} = 58g$
$\sqrt{8281} = 91$

$(58g - 91)^2$

8) $-3025, -1024$

⑥ $400d^2 - 3025d - 1024d + 7744$

⑦ $25d(16d - 121)$
$-64(16d - 121)$

⑧ $25d(16d - 121) - 64(16d - 121)$

⑨ $(25d - 64)(16d - 121)$

9) $-10290, -840$

⑥ $400h^2 - 10290h - 840h + 21609$

⑦ $10h(40h - 1029)$
$-21(40h - 1029)$

⑧ $10h(40h - 1029) - 21(40h - 1029)$

⑨ $(10h - 21)(40h - 1029)$

10) PERFECT SQUARE POLYNOMIAL

$2085136\ K^4 - 5848200\ K^2 + 4100625$

$\sqrt{2085136\ K^4} = 1444K^2$
$\sqrt{4100625} = 2025$

$\sqrt{1444K^2} = 38K$
$\sqrt{2025} = 45$

$(38K + 45)^2\ (38K - 45)^2$

FP Execise 5

11) $36(2a^2-3)^2 - 44(2a^2-3) - 15$

$= 36(4a^4-9) - 44(2a^2-3) - 15$

$= 144a^4 - 324 - 88a^2 + 132 - 15$

$= 144a^4 - 88a^2 - 207$

① $-88 \div 2 = -44$

② $(-44)^2 = 1936$

③ $1936 - - 29808 = 31744$

④ $\sqrt{31744} = 32\sqrt{31}$ ⇒ Irrational number

∴ $144a^4 - 88a^2 - 207$ cannot be further factored

12) $81(7a+3)^4 - 72(7a+3)^2 + 16$

$= 81(2401a^4 + 81) - 72(49a^2 + 9) + 16$

$= 194481a^4 + 6561 - 3528a^2 - 648 + 16$

$= 194481a^4 - 3528a^2 + 5929$

① $-3528 \div 2 = -1764$

② $(-1764)^2 = 3111696$

③ $3111696 - 1153077849 = -1149966153$ ↙ since it is negative, it cannot be square rooted rationally

Althagh we can't factor it to $(ax+b)(cx+d)$, we can still do this:

$GCF(194481, -3528, 5929) = 49$

$49(3969a^4 - 72a^2 + 121)$

13) $-588, -252$

⑥ $504m^2 - 588m - 252m + 294$

⑦ $84m(6m-7)$
$-42(6m-7)$

⑧ $84m(6m-7) - 42(6m-7)$

⑨ $(84m-42)(6m-7) \longrightarrow 42(2m-1)(6m-7)$

14) $10829, -9724$

⑥ $6188n^2 + 10829n - 9724n - 17017$

⑦ $1547(4n+7)$
$-2431(4n+7)$

⑧ $1547(4n+7) - 2431(4n+7)$

⑨ $(1547n-2431)(4n+7) \longrightarrow 221(7n-11)(4n+7)$

B) 1) Perfect Square Polynomials $\longrightarrow$ Question 7

2) ?