Study Question – Parallel Development

The Goose Liver firm has two competing R&D projects, project X and project Y, either of which will undoubtedly increase Liver per Goose by 10%. But the costs of each project are uncertain! Here's a good estimate[1]:

Project X: 50% probability that it will cost $100, and a 50% probability that it will cost $200

Project Y: 40% probability that it will cost $80, and a 60% probability that it will cost $210 dollars.

The firm has three options, described below:

1) Go with project X
2) Go with project Y
3) Allow each project to proceed. The firm is certain that after a month, when each project has already spent $25, it will know for certain which project is cheaper. The firm will then discontinue the expensive project and proceed with the cheaper project.

What should the firm do?

[1] All dollar amounts include opportunity costs and are discounted to their present value.

Let's examine each of these options:

OPTION (1) Go with Project X: the expected value of the cost of this choice is
expected value = .50(100) + .50(200) = $150

OPTION (2) Go with Project Y: the expected value of the cost of this choice
expected value = .40(80) + .60(210) = $158

Go with OPTION (3):
There are four possible outcomes to this option:

(i) After spending $25 on Project X, it is abandoned because it will cost $200. Project Y is continued, and Project Y costs $80.

(ii) After spending $25 on Project X, it is abandoned because it will cost $100. Project Y is continued, and Project Y costs $80.

(iii) After spending $25 on Project Y, it is abandoned because it will cost $210. Project X is continued, and Project X costs $100.

(iv) After spending $25 on Project Y, it is abandoned because it will cost $210. Project X is continued, and Project X costs $200

Let's calculate the probability that each outcome (i)-(iv) will occur[2].

(i) = .50 x .40 = .20

(ii) = .50 x .40 = .20

(iii) = .60 x .50 = .30

(iv) = .60 x .50 = .30

So the expected value of the cost of OPTION (3) is:

Expected value = .20(25 + 80) + .20(25 + 80) + .30(25 + 100) + .30(25 + 200)

= 5 + 16 + 5 + 16 + 7.5 + 30 + 7.5 + 60

= $147

Analysis of options (1), (2), and (3):
Compare the expected values of the costs of options (1), (2), and (3), which I rewrite here:

expected value of cost of OPTION (1): $150

[2] The probability of two events occurring together, recall, is the probability that one will occur multiplied by the probability that the other will occur.

expected value of cost of OPTION (2): $158
expected value of cost of OPTION (3): $147

Option (3)—parallel development efforts—has the lowest expected value, so it should be chosen.