

Investment appraisal: an e-bike fleet or a tour van?

Teacher guidance and answers | Original TBS classroom practice

Use this lesson after students have met payback, average rate of return and discounted cash flow. Students calculate all three for two projects, test how sensitive the answer is to a weaker forecast and write a recommendation. The tasks are planned to take about 55 minutes and have not been trialled in a classroom. The minutes include brief answer checking but not handing out materials or a full plenary; allow about 65 minutes in the timetable. Suited to Year 13 classes studying Edexcel 9BS0 Theme 3, or Year 12 classes who have reached investment appraisal.

Curriculum fit

Pearson Edexcel Level 3 Advanced GCE in Business (9BS0), Specification Issue 1, September 2014, Theme 3, section 3.3.2 Investment appraisal (printed page 22): (a) simple payback, (b) average (accounting) rate of return, (c) discounted cash flow (net present value only), (d) calculations and interpretations of figures generated by these techniques, (e) limitations of these techniques. Checked against the archived Issue 1 specification; please confirm the specification for your cohort with your exams officer. This is a TBS lesson, not a Pearson resource; it is not endorsed by Pearson and uses no Pearson exam questions or mark schemes.

Conventions used in this lesson: for payback, inflows are assumed to arrive evenly through each year (so part-years can be counted in months); for NPV, each year's inflow is treated as arriving at the end of that year. ARR uses the initial cost as the base (some textbooks use average investment; accept that method if the student states it). Payback part-years are rounded up to whole months. Present values are rounded to the nearest £ before adding. Discount factors are given to three decimal places. All business details and numbers are fictional. The answers are indicative teaching guidance only. There is no official mark tariff, level descriptor or AO allocation for these tasks and no grade claim is made.

Lesson plan (about 55 minutes of tasks, estimated)

Stage	Minutes	What happens
Starter: which technique?	5	Match three descriptions.
Task 1: payback	10	Cumulative cash flow for both projects.
Task 2: ARR	8	Average annual profit as a percentage of cost.
Task 3: NPV	12	Present value table and the time value of money.
Task 4: test the forecast	8	NPV and payback with weaker Years 3 and 4.
Task 5: decide	8	Written recommendation.
Exit ticket	4	Two quick questions.
Total	55	

45-minute version: starter 4, Task 1 7, Task 2 6, Task 3 10, Task 4 6, Task 5 8, exit ticket 4. Keep both projects for every student, because Task 5 needs both; skip Task 3b and ask for about 60 words in Task 5. This timing has not been trialled. The 45 minutes are task time only, so in a real 45-minute period, with handing out and feedback, move the exit ticket to homework.

Answers: starter, Task 1 and Task 2

Indicative guidance for teachers. This is not an exam board mark scheme and carries no marks or grades.

Starter: (i) payback; (ii) NPV; (iii) ARR.

Task 1	Answer	Working
a. Project A payback	2 years 10 months	Cumulative: Year 1 12,000; Year 2 26,000; still need 14,000. Year 3 brings 16,800, which is 1,400 a month: $14,000 / 1,400 = 10$ months.
b. Project B payback	2 years 9 months	Cumulative: Year 1 10,000; Year 2 19,000; still need 6,000. Year 3 brings 8,000: $6,000 / 8,000 \times 12 = 9$ months.

Task 2	Answer	Working
a. Project A ARR	12.5%	Total inflows 60,000 - cost 40,000 = profit 20,000; over 4 years = 5,000 a year; $5,000 / 40,000 \times 100 = 12.5\%$.
b. Project B ARR	9.0%	Total inflows 34,000 - cost 25,000 = profit 9,000; over 4 years = 2,250 a year; $2,250 / 25,000 \times 100 = 9.0\%$.

Task 2c: Project B pays back slightly faster (one month sooner), but Project A has the higher ARR (12.5% against 9.0%), so the two methods point in different directions. Accept any clear sentence that names both results.

Common errors: forgetting to subtract the initial cost before averaging; dividing by 5 years instead of 4; stating payback as 2.8 years without converting to months; rounding months down.

Answers: Task 3

Present values (£)	Discount factor	Project A	Project B
Year 1	0.926	11,112	9,260
Year 2	0.857	11,998	7,713
Year 3	0.794	13,339	6,352
Year 4	0.735	12,642	5,145
Total present value		49,091	28,470
Less initial cost		40,000	25,000
Net present value		9,091	3,470

Working: Project A $12,000 \times 0.926 = 11,112$; $14,000 \times 0.857 = 11,998$; $16,800 \times 0.794 = 13,339.2$, rounded to 13,339; $17,200 \times 0.735 = 12,642$. Project B $10,000 \times 0.926 = 9,260$; $9,000 \times 0.857 = 7,713$; $8,000 \times 0.794 = 6,352$; $7,000 \times 0.735 = 5,145$. Accept answers within £2 if a student did not round each present value first (for example Project A 9,091.2).

Task 3b: money received later is worth less today because it could have been invested or used to repay borrowing in the meantime (here at 8%), and later cash is less certain. So £1,000 in Year 4 is worth only £735 today, against £926 in Year 1.

Teaching point: both projects have a positive NPV at 8%, so both earn more than the cost of borrowing on these forecasts. Project A adds about £5,600 more value ($9,091 - 3,470 = 5,621$) but needs £15,000 more money up front and depends on bookings growing.

Answers: Task 4, Task 5 and exit ticket

Task 4	Answer	Working
a. New inflows and NPV	Year 3 13,440; Year 4 13,760; NPV £3,895	$16,800 \times 0.8 = 13,440$; $17,200 \times 0.8 = 13,760$. Present values $11,112 + 11,998 + 10,671 + 10,114 = 43,895$ $(13,440 \times 0.794 = 10,671.36$; $13,760 \times 0.735 = 10,113.6)$. $43,895 - 40,000 = 3,895$.
b. New payback	3 years 1 month	After Year 3 the cumulative inflow is $12,000 + 14,000 + 13,440 = 39,440$, still 560 short. Year 4 brings 13,760, about 1,146.67 a month: $560 / 1,146.67 = 0.49$, rounded up to 1 month.
c. Comparison	Yes, just	Project A's NPV falls from 9,091 to 3,895, only 425 above Project B's 3,470, and its payback is now four months later than Project B's instead of one. Most of Project A's advantage depends on the Year 3 and 4 forecasts.

Task 5: indicative decision guidance

A well supported answer chooses one project and uses figures. Example response (not a mark scheme): I recommend Project A. On the forecasts it has the higher NPV (£9,091 against £3,470) and the higher ARR (12.5% against 9.0%), so it adds more value even after allowing for the 8% cost of borrowing. However, it costs £15,000 more, pays back a month later, and if Years 3 and 4 are 20% weaker its NPV falls to £3,895, barely above Project B. The main limitation is that the figures are only forecasts, so I would check how certain the bookings growth is before buying.

Students could reasonably choose Project B if they stress the lower cost, the faster payback and the smaller risk if forecasts are wrong. Other limitations students may use: the 8% discount rate is a choice and a different rate changes NPV; the techniques ignore qualitative factors such as staff skills, brand image or the owner's attitude to risk; payback ignores cash after the payback point. Look for correct figures, a clear comparison, a limitation tied to the case and a conclusion that depends on the evidence. Do not award a grade or percentage from these tasks.

Answers: exit ticket

a. It could be invested or used to repay borrowing meanwhile (opportunity cost); inflation reduces what it buys; later cash is less certain. b. After 3 years the project has returned 9,000, so 1,000 is still needed. The fourth year brings 3,000, which is 250 a month: $1,000 / 250 = 4$ months. Payback is 3 years 4 months.

Sources and limits

Curriculum source: Pearson Edexcel Level 3 Advanced GCE in Business specification, Issue 1, September 2014, Theme 3, section 3.3.2 (printed page 22). The specification verifies the topic scope only. The tasks, figures, discount factors, timings and guidance are original TBS teaching design.