PRACTICE 4.2 – Gradient of a Line

* Full, worked solutions can be found in the folder linked on the Course Website ☺

Exercise 4C

1 Find, in each case, the set of possible coordinates of a point A which lies on a:

- **a** horizontal line passing through B(−4, −8)
- **b** vertical line passing through B(−3, 7).

2 Find the gradients (slopes) of the lines passing through the following pairs of points:

- **a** A(2, 3) and B(−1, 4)
- **b** A(−11, 2) and B(2, 7)
- **c** A(−1.3, 2.2) and B $\left(1\frac{1}{5}, -0.3\right)$.

3 Find the gradients of the stairs for which information is given in the table below:

Stair #	Step rise (cm)	Step run (cm)	Gradient
Stair 1	12	25	
Stair 2	10	20	
Stair 3	15	18	

- **a** State which stair has the greatest gradient.
- **b** State which stair has the least gradient.

4 Draw the graph of the straight line:

- **a** passing through (0, 0) and (−5, 6)
- **b** passing through (−1, 2) and (−3, −5).

5 Find the gradient of the line:

- **a** passing though (−1, −1) and (3, 2)
- **b** passing through (0, 2.5) and $\left(\frac{-1}{3}, 5\right)$.

6 A skier travels downhill along two slopes: one with gradient −3 and the other with gradient $\frac{-1}{3}$. State which slope is the steeper, justifying your answer.

7 MegaLift plans ski slopes and lift stations along the slopes. Find the height of a ski lift station B(490, h), which is on a slope with gradient 0.35 and which passes through a lower lift ski station A(90, 10). All coordinates are given in metres.

Unit Rates Practice on next page

PRACTICE 4.2 – Unit Rates

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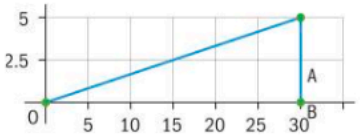
Exercise 4D

1 Safety regulations for wheelchair ramps mandate that the maximum gradient of the ramps should not exceed 0.08. Calculate the gradient of the triangular ramp ΔAOB ([AB] ⊥ [OB]) shown below, and determine whether it conforms to the safety regulations.



2 A town website advertises summer jobs for students. A student is trying to decide between a job as a city guide and a job at a flower shop. The job as a city guide pays $40 per day plus a monthly metro card with $120 value. The job at the flower shop pays $60 a day.

Compare the payments for the two jobs.

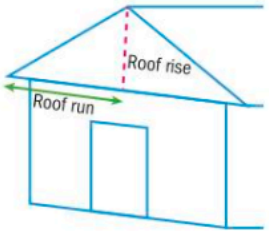
a Complete the table below:

Number of days worked	City guide (USD)	Flower shop (USD)
1	160	60
5		
10		

b Draw the lines representing the payments for each job. On the same pair of axes, where x is the number of days worked and y is the payment in dollars.

c Explain how the student should decide which job to take based on the number of days they plan to work during the month.

3 US roof regulations state that asphalt tiles can only be used for roofs with a maximum gradient of 0.17. The roof shown in the diagram has width 7 m and rise 1.6 m. Find:



a the roof run

b the roof gradient.

c Determine whether the roof satisfies the requirements for using asphalt tiles. Justify your conclusion.

4 Road signs showing the steepness of hills are often given as percentages, as in the one shown below, where the figure is derived using the formula

$$\frac{\text{rise (vertical change)}}{\text{run (horizontal change)}} \times 100\%$$

a For a certain road the vertical change is 5 m for a horizontal change of 20 m. Determine the percentage that would be written on the sign for this road.

b Which is the steeper road—the one with a sign indicating 10% incline or another with a sign indicating 15%?

c Determine the vertical change corresponding to a horizontal change of 5 km for a road with sign indicating 15% incline.

5 The ski slopes in the Scotch Pine Ski Resort are marked by colour as an indicator of the incline. The colours used are green, blue, red and black. Green is used for slopes with less than 20% incline, blue for 20–25%, red for 25–40% and black for above 40% incline.

a Classify the following slopes as blue, green, red or black:

i P_1 with a horizontal change of 450 m and a vertical change of 280 m that passes through O(0, 0)

ii P_2 with a horizontal change of 150 m and a vertical change of 50 m that passes through O(0, 0)

iii P_3 with a starting point at the top $B_1(310, 48)$ and an end at O(0, 0)

iv P_4 with a starting point at the top $B_2(230, 56)$ and an end at O(0, 0).

b On a pair of axes, graph each line, label it, and mark it with the respective colour.

c Determine the angle of inclination, α, of slope P_2.