c) **i)** In 1 h, Yvonne travelled approximately 24 km.

So, in $1\frac{3}{4}$ hours, Yvonne travelled: $\left(1\frac{3}{4}\right)(24 \text{ km}) = 42 \text{ km}$

In $1\frac{3}{4}$ hours, Yvonne travelled approximately 42 km.

ii) Yvonne travelled approximately 24 km in 1 h, or 60 min.

To travel 1 km, Yvonne took: $\frac{60 \text{ min}}{24} = 2.5 \text{ min}$

So, to travel 55 km, Yvonne took:
$55(2.5 \text{ min}) = 137.5 \text{ min}$, or 2 h 17.5 min
Yvonne took approximately 2 h 20 min to travel 55 km.

Discuss the Ideas

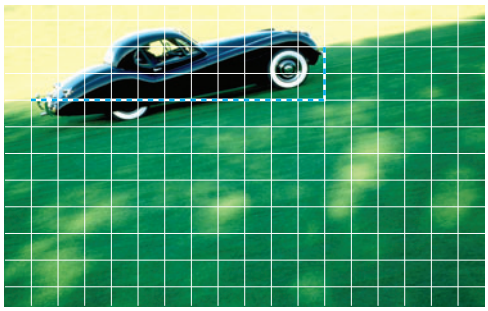
1. When you look at a line on a grid, how can you tell whether its slope is positive, negative, 0, or not defined? Give examples.
2. Why can you choose any 2 points on a line to determine its slope?
3. When you know the coordinates of two points E and F, and use the formula to determine the slope of EF, does it matter which point has the coordinates (x_1, y_1)? Explain.

Exercises

A

4. Determine the slope of the road in each photo.

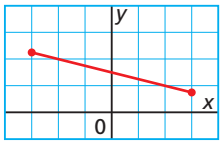
a)



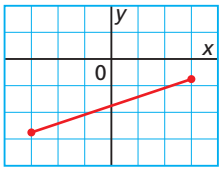
b)

5. For each line segment, is its slope positive, negative, zero, or not defined?

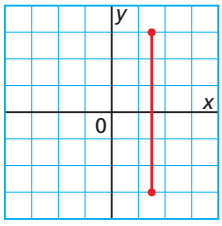
a)



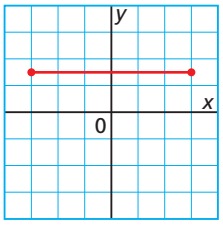
b)



c)

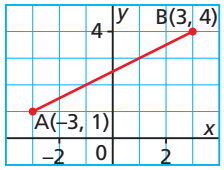


d)

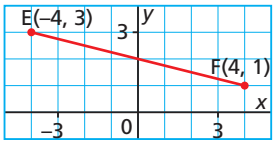


6. For each line segment, determine its rise, run, and slope.

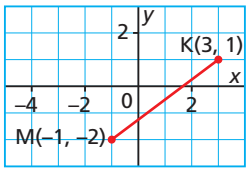
a)



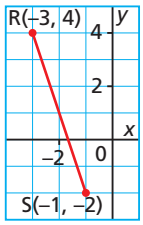
b)



c)



d)



7. Determine the slope of each line described below.

a) As x increases by 1, y increases by 3.

b) As x increases by 2, y decreases by 7.

c) As x decreases by 4, y decreases by 2.

d) As x decreases by 2, y increases by 1.

8. Sketch a line whose slope is:

a) positive **b)** zero

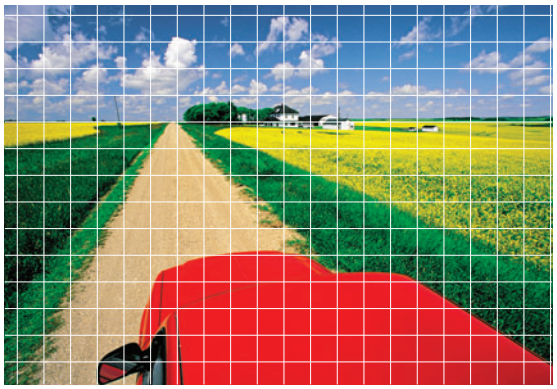
c) negative **d)** not defined

9. Draw a line segment that has one endpoint at the origin and whose slope is:

a) $\frac{2}{3}$ **b)** $-\frac{2}{5}$ **c)** 4 **d)** $-\frac{4}{3}$

10. To copy a picture by hand, an artist places a square grid over the picture. The artist then copies the image on a different grid, making sure corresponding grid squares match.

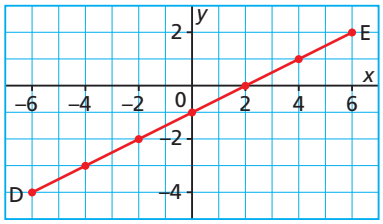
a) How would determining the slopes of lines in the picture help a person to copy the picture?



b) Copy the picture above, using the strategy you described in part a.

B

11. **a)** Choose two points on line segment DE. Use these two points to determine the slope of the line segment.



b) Choose two different points on segment DE and calculate its slope.

c) Compare the slopes you calculated in parts a and b. Explain the results.

12. **a)** Draw 2 different line segments with slope $\frac{7}{5}$.

b) How are the line segments in part a the same? How are they different?

13. **a)** Determine the slope of the line that passes through each pair of points.

i) P(1, 2) and Q(3, 6)

ii) S(0, 1) and T(8, 5)

iii) V(−1, 4) and R(3, −8)

iv) U(−12, −7) and W(−6, −5)

b) Explain what each slope tells you about the line.

14. **a)** On a grid, draw a line that passes through 3 points. Label the points C, D, and E.

b) Determine the slope of each segment.

i) CD **ii)** DE **iii)** CE

What do you notice?

15. **a)** A treadmill is set with a rise of 6 in. and a run of 90 in. What is the slope of the treadmill?

b) The treadmill is set at its maximum slope, 0.15. The run is 90 in. What is the rise?

16. A trench is to be dug to lay a drainage pipe. To ensure that the water in the pipe flows away, the trench must be dug so that it drops 1 in. for every 4 ft. measured horizontally.

a) What is the slope of the trench?

b) Suppose the trench drops $6\frac{1}{2}$ in. from beginning to end. How long is the trench measured horizontally?

c) Suppose the trench is 18 ft. long measured horizontally. By how much does it drop over that distance?

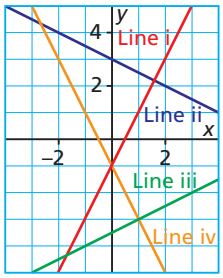
17. Match each line below with a slope. Explain your choices.

a) slope: –2

b) slope: $\frac{1}{2}$

c) slope: $-\frac{1}{2}$

d) slope: 2



18. **a)** Draw the line through each pair of points. Determine the slope of the line.

i) B(0, 3) and C(5, 0)

ii) D(0, –3) and C(5, 0)

iii) D(0, –3) and E(–5, 0)

iv) B(0, 3) and E(–5, 0)

b) How are the slopes of the lines in part a related?

19. **a)** Explain why the slope of a horizontal line is zero.

b) Explain why the slope of a vertical line is undefined.

20. Four students determined the slope of the line through B(6, −2) and C(−3, −5). Their answers were: 3, −3, $\frac{1}{3}$, and $-\frac{1}{3}$

a) Which number is correct for the slope of line BC? Give reasons for your choice.

b) For each incorrect answer, explain what the student might have done wrong to get that answer.

21. **a)** On a grid, sketch each line:

i) a line that has only one intercept

ii) a line that has two intercepts

iii) a line that has more intercepts than you can count

b) How many lines could you draw in each of part a? What is the slope of each line?

22. A hospital plans to build a wheelchair ramp. Its slope must be less than $\frac{1}{12}$. The entrance to the hospital is 70 cm above the ground. What is the minimum horizontal distance needed for the ramp? Justify your answer.

23. Draw the line through G(−5, 1) with each given slope. Write the coordinates of 3 other points on the line. How did you determine these points?

a) 4 **b)** −1

c) $-\frac{1}{3}$ **d)** $\frac{7}{4}$